

# Light and Lighting

K.—No. 2

February, 1937

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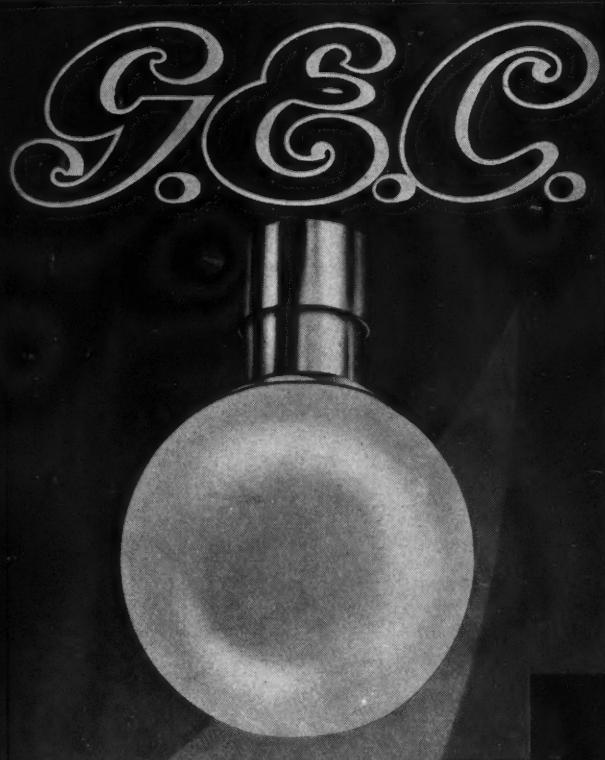
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# Utility Lighting

Two examples from a range of fittings which includes both totally enclosed and open type units, each with a patent canopy which leaves both hands free for attaching or removing the globe. All types incorporate the following features:—

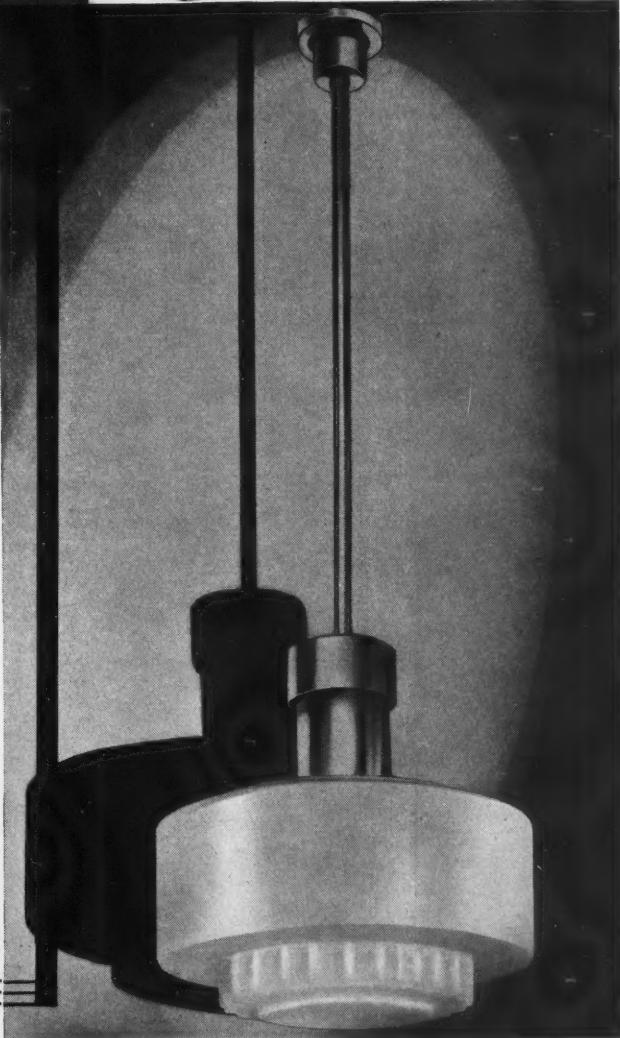
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GLASSWARE OF THE HIGHEST  
EFFICIENCY

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COPPER, CHROMIUM PLATED OR  
IN REAL BRONZE COLOUR

Write for catalogue F7860 which contains  
full particulars of this range of fittings.



# BETTER LIGHT BETTER SIGHT

## ONE LIGHTING POINT IS NOT ENOUGH

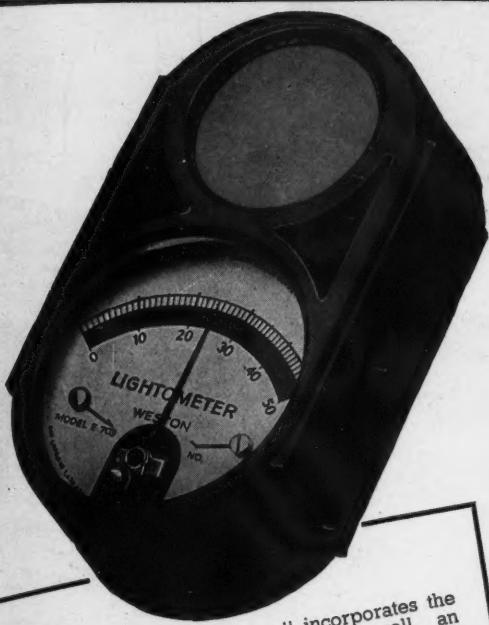
Apart from the fact that most homes are poorly equipped with light—that they have too few lighting points and that these points carry lamps that are too small—it is extremely probable that the fittings are of the wrong type and wrongly placed. Lighting science has proved that portable standard lamps are necessary to give that extra light required for reading or sewing.

Our illustration shows how insufficient is the light from the ordinary ceiling shade. The eye-strain, consequent upon the effort of sewing in an unsuitable light must eventually lead to headaches and some loss of health.



The E.L.M.A. Lighting Service Bureau is maintained by the manufacturers of the following brands of British Made lamps

**OSRAM MAZDA EDISWAN  
SIEMENS COSMOS CRYSELCO**



The WESTON "Lightometer" incorporates the famous "Photronic" photo-electric cell, an exclusive WESTON feature. Small, portable and of rugged construction, it does not suffer deterioration or change in calibration, even though exposed to direct sunlight. As a double-range instrument it gives readings of 0.50 and 0.500 foot-candles.

**As easy as reading the time**  
*You can let customers test  
their own lighting  
with the*  
**WESTON "LIGHTOMETER"**

"More Light—Better Sight." This slogan is making consumers conscious of the need for more light and all that it implies in terms of lamps and fittings.

*But how much more light do we need?* That is the question your customers will ask. Put yourself in a position to tell them quickly and accurately by using the pocket-sized WESTON "Lightometer."

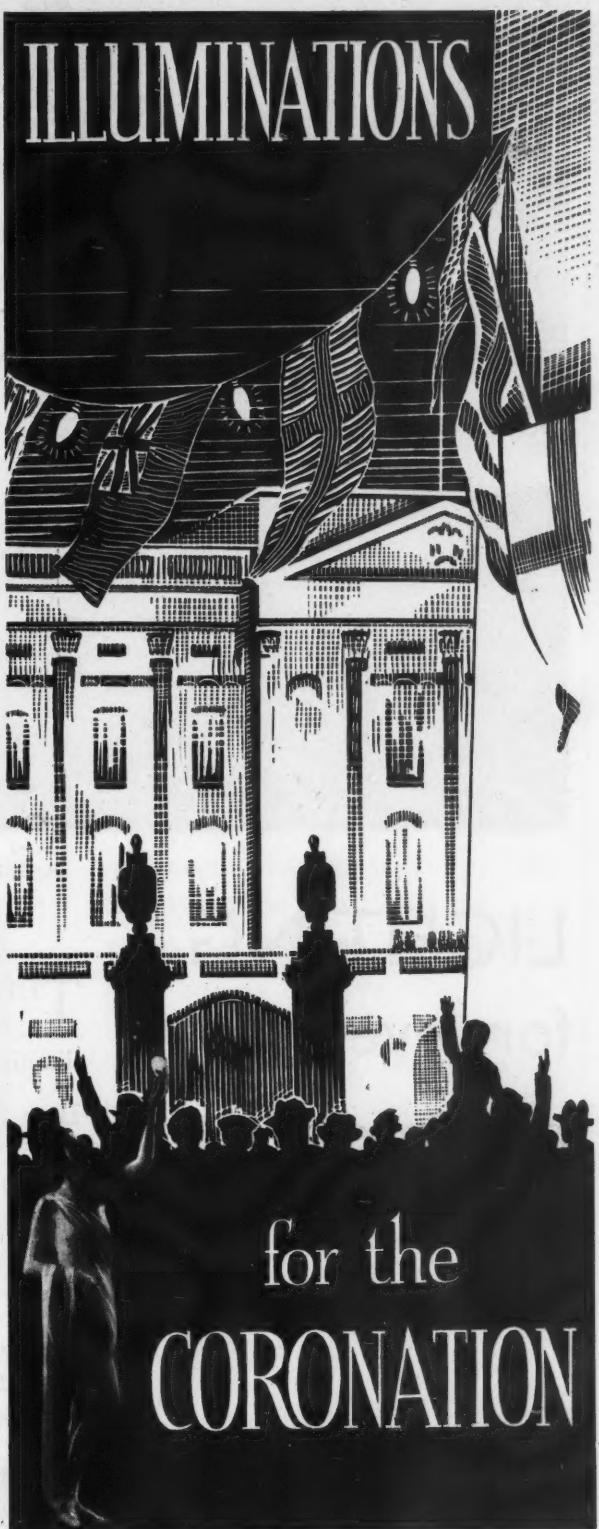
Measuring lighting with the WESTON "Lightometer" is "as easy as telling the time." In fact, your customers can take their own readings just as accurately as you can.

Take this handy little instrument round in your pocket. You can use it dozens of times a day to get additional orders for lighting equipment.

# WESTON

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*Advertisement of the Weston Electrical Instrument Co., Ltd., Kingston By-pass, Surbiton, Surrey. Elmbridge 6400*



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**CRYSELCO LTD, KEMPSTON WORKS, BEDFORD  
AND HOME BRANCHES**



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Architects: James M. Munro & Sons, A.R.I.B.A.

## LIGHTING for every purpose—

THE revenue-earning capacity of a hall which is to be available for hiring depends very much upon illumination.

Here is a type of lighting which is equally appropriate for concerts, meetings, dances or indoor sports. The neat G.V.D. units, designed to fit flush into the ceiling angle, eliminate glare, ensure remarkable distribution of light over the entire area, and give ample clearance for even the most energetic badminton player.

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CONTROLLED LIGHT

G.V.D. ILLUMINATORS, LTD., ALDWYCH HOUSE, LONDON, W.C.2.—HOLBORN 7277-8

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**LOOKS Right  
and IS right!**

DUOFLUX—a Spotlight and Floodlight in one, for use with either gasfilled lamps (300 to 1,500 watts) or Electric Discharge Lamps (150 to 400 watts).

A Typical Duoflux Installation.

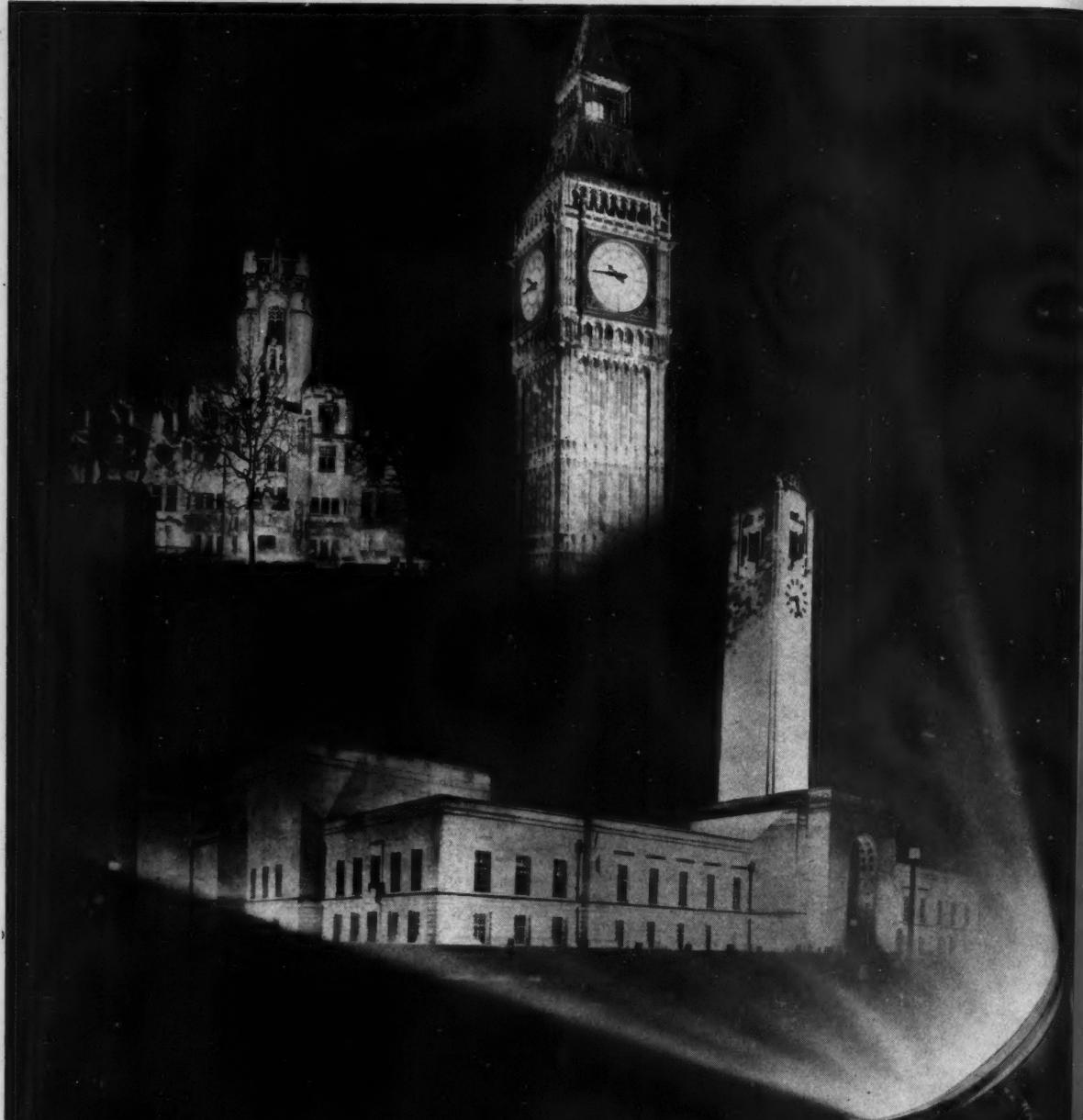


First impressions are very often the best. The very appearance of the DUOFLUX floodlight conveys an unmistakable impression of efficiency which is more than confirmed by its actual performance. It **looks** right and **is** right for the floodlighting of Hotels, Garages, Swimming Pools, Forecourts, Gardens and open spaces generally.

We can advise you, **without obligation or cost**, on all your Floodlighting problems.

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**DUOFLUX** REGD.  
*The economical* **FLOODLIGHT**

ADVERT. OF THE BENJAMIN ELECTRIC LTD., BRANTWOOD WORKS, TOTTENHAM, LONDON, N.17.



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**FLOODLIGHTING**

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"The  
Illuminating  
Engineer."

# Light and Lighting

32, Victoria St.  
London, S.W.1

Official Journal  
of the  
Illuminating  
Engineering  
Society.

Edited by J. STEWART DOW

Telephone:  
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February, 1937

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## Professional Status for Illuminating Engineers?

PUBLIC Lighting Engineers are now seeking to establish their professional status, by outlining courses of study and conditions of experience as a basis for a diploma. No doubt there are difficulties. Perhaps few existing engineers can fulfil the ideal conditions completely—for example, in regard to familiarity with all systems of lighting and ability to take a completely independent view. But the number will grow and in the meantime the duties and qualifications of a Public Lighting Engineer—a special variety of illuminating engineer—can be defined with precision.

During recent years, a desire—quite a natural desire—for professional status on the part of some of the members of the Illuminating Engineering Society has made itself evident. The Council has been for some time exploring the position. The ultimate result, we believe, may be the setting up of machinery for examinations by an outside educational authority, on the top of which the Illuminating Engineering Society might impose certain additional conditions for those of its members who desire some recognition of expert knowledge and experience.

But the problem is a complex one. There are within the ranks of the Society all manner of experts with special fields of knowledge and special limitations—which must be reflected by qualification in a professional distinction. Our view is that the Society should only confer such a distinction on its own members—though it would be in no sense a condition of membership.

The complete illuminating engineer is yet to seek—partly because the need for his services, though it does exist, is not yet publicly realised. That is the position. In the words of an American humorous poet, "It is—though it hadn't ought to be!"



# NOTES & NEWS ON

## ILLUMINATION

**I.E.S. Silver Jubilee Award—Does Intense Lighting Accentuate Contrast?**—I.E.S. (U.S.A.): General Secretary's Report—New Earl's Court Exhibition Building—A Case of "Lumens at Law"—Daylight Doesn't Always Help—E.L.M.A. Lighting Service Bureau of Scotland.

### I.E.S. Silver Jubilee Award

We have been asked to draw attention to the Silver Jubilee Commemoration (1934) Award of five guineas, granted annually by the Illuminating Engineering Society, which is open to members of any class who are under twenty-six years of age. The conditions are very wide. The award may be made (1) for a suitable paper dealing with illuminating engineering, (2) the design or construction of a novel instrument or appliance for use in researches on illumination, or (3) the carrying out of any investigation beneficial to illuminating engineering. Such efforts need not have been done for the Society—they may have been undertaken for any other body. All that the applicant has to do is to submit a copy of the paper, or an account of the design or research to the Honorary Secretary of the Society. Applications relating to the present session should, however, be sent in before the end of June. It will be recalled that the first effort to gain this award was the very useful research by Mr. Ralph Hopkinson on photographs of street lighting installations. We feel sure that there must be other efforts by the younger members of the Society well worthy of record, and hope that they will not hesitate to try their luck.

### Does Intense Lighting Accentuate Contrast?

This is not the first time we have drawn attention to the effects of exceptionally high illumination by concealed sources on photographs and pictures. It has been remarked, for example, that the pictorial views displayed in connection with trade exhibits at Charing Cross (Underground) Station seem to gain remarkable vividness from the strong illumination usually provided, which also seems to give an impression of distance and a certain stereoscopic effect. In the writer's experience, this "vividness" seems to consist mainly in an apparently enhanced contrast. The same thing can be seen even more vividly in some of the picture displays in shops north of St. James's Park. Here, no doubt, the effect is accentuated by artful choice of subject—pictures of snow scenes illuminated by the setting sun, with their strong shadows, lend themselves well to local lighting, but in the case of pictures representing the play of sunlight through foliage and on water, the effect is also striking. Occasionally the difference, as compared with a picture lighted in the ordinary way, is almost equivalent to that between a lantern slide (with actually much greater contrasts) and a photo-

graphic print. A vital condition appears to be that the eye should be in comparative darkness and the source of light completely screened. One is tempted to enquire whether we have here merely a psychological effect—an illusion—or whether exceptionally high illumination (or accentuated a contrast between the brightness of a picture and its surround) does physiologically magnify existing con-

### Forthcoming Events

**Feb. 9th.** Mr. H. C. WESTON on **Lighting and Industrial Performance.** (Meeting of the Industrial Lighting Section of the Illuminating Engineering Society at Watson House, Townmead Road, Fulham, S.W.6) ; 6.30 p.m.

**Feb. 12th.** **Informal Social Evening** of the Illuminating Engineering Society (at St. Ermine Hotel, St. James's Park, S.W.1) ; 6.30 p.m. Tickets 2/6 each.

**Feb. 17th.** Mr. G. H. WILSON on **Road Lighting and Road Surfaces.** (Meeting of the Institute of Civil Engineers (Manchester District) at 36, George Street, Manchester) ; 6.0 p.m.

**Feb. 18th.** Mr. P. FREEDMAN on **Low Voltage Neon.\*** (Local Sectional Meeting of the Illuminating Engineering Society at Cadora Restaurant, Union Street, Glasgow) ; 7.30 p.m.

**Feb. 22nd.** Mr. G. T. WINCH on **Some Practical Aspects of Precision Photometry.** (Meeting of the Photometric Section of the Illuminating Engineering Society at the Research Laboratories of the General Electric Company, Ltd., Wembley) ; 6.0 p.m.

**Feb. 23rd.** Mr. HOWARD LONG on **Diffusion and Shadow.** (General Meeting of the Illuminating Engineering Society at the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2) ; 6.30 p.m.

**March 9th.** Two papers reviewing **Street Lighting Problems** by Dr. S. ENGLISH and Mr. R. MAXTED (General Meeting of the Illuminating Engineering Society in the Lecture Theatre of the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1) ; 6.30 p.m.

**March 16th.** **Annual Dinner** of the Illuminating Engineering Society (at the Trocadero Restaurant, Piccadilly, London, W.1) ; 6.45 p.m. for 7.30 p.m.

\*Repetition of paper read in London on December 8, 1936.

trasts in brightness in the picture itself? It would seem that existing researches do not answer this question, for they merely relate to the threshold effect. They suggest that the smallest perceptible change in brightness remains constant over a wide range—but they do not indicate whether a fairly high contrast can be apparently magnified by increasing the general brightness.

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## Illuminating Engineering Society (U.S.A.). General Secretary's Report

From the report of the general secretary of the American Illuminating Engineering Society, which appears in the December Transactions of that body, one is glad to see that improvement is maintained. Depression is definitely a thing of the past, even though the membership has not yet climbed back to the high water-mark of 1930 (over 2,000). The operations are, naturally, on a larger scale than in the case of the smaller British Society, but one can see that in several respects their experiences run parallel. In the United States expenditure is, in general, only slightly below income, and last year overstepped it slightly—a condition which we in this country, with continually expanding activities, may have to face. One also observes that in the case of most forms of membership the increase is small. It is in the case of associate members, who pay the smaller fees, that the increase during recent years has been pronounced. The income of the Society is rather under £7,000—about seven times that of the British Society. The highest item of expenditure (salaries, £2,200) has no parallel with us, whilst rent and office expenses appear to be rather more than twice as great, and the cost of the Transactions (approximately £1,600) probably about six times as great. There is also expenditure on other forms of effort, such as the annual convention, which we cannot attempt as yet. Members may, however, well feel that, with its much smaller resources, the British Society does not do so badly.

## The New Earl's Court Exhibition Building

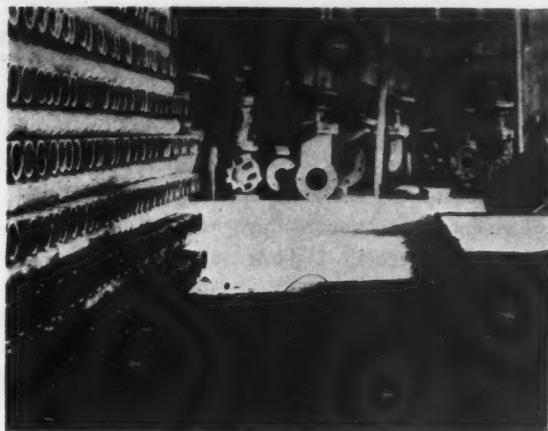
The new Earl's Court Building, which is to be completed by the end of March, will have many interesting architectural features. It is understood that the lighting has received special attention. The plan of blocking out all daylight, followed at the last Ideal Home Exhibition, is to be adopted. The lighting will be entirely artificial, and the illumination of the ceiling can be carried out in various colours and with great diversity of effect. We hear that the projection of luminous coloured patterns on the ceiling is to be a special feature. It is expected, also, that the use of an asbestos roof will automatically limit the heat in summer and enable the temperature to be kept well under control.

## A Case of "Lumens at Law"

"With all the talk that one hears about 'rogue motorists,' the statistics show that less than five percent. of the fatal accidents are caused by all the convicted road-hogs, drunken drivers and inexperienced motorists put together.

"Nobody calls bad lighting or skating-rink surfaces 'criminal.' Or, rather, nobody ever dreams of taking action against those who are responsible for perpetuating them, instead of substituting lighting systems and surfaces which conduce to safety."—*Evening News*.

## Daylight Doesn't Always Help



The picture above, which was shown by Mr. E. W. Murray on the occasion of his recent paper before the Illuminating Engineering Society, may serve to show that daylight is not always the ideal form of lighting; occasionally, in fact, it is a hindrance rather than a help. Here we have an interior lighted to a moderate extent by a certain amount of diffused daylight, supplemented by artificial light. Through one aperture there enters a streak of bright sunlight making a brilliant "splash" on the floor, with the result that the background beyond it appears relatively dark. Anyone advancing towards such a patch is very liable to be dazzled by the extreme contrast, and, as a matter of fact, accidents due to just such conditions as these are known to have occurred.

## E.L.M.A. Lighting Service Bureau of Scotland—A Successful Progress Course

A report of the above course, conducted at the Royal Technical College last autumn, suggests that it answered anticipations very well. In accordance with the familiar method in London, weekly lectures were arranged, six live subjects being selected. A somewhat remarkable feature was the constant attendance which was maintained throughout—between 200 and 250, though over 1,300 different people took part. Apparently, the largest contingent in the audience (about 26 per cent.) came from electric supply organisations, electrical contractors (20 per cent.) and representatives of E.L.M.A. firms (19½ per cent.) coming second and third. Mr. T. Catten himself handled the opening lecture ("Modern Methods of Illumination Design"), Mr. W. J. Jones the second ("The New Science of Seeing"), and Mr. J. W. Howell the third ("Modern Industrial Lighting")—other topics being "Electric Discharge Lamps," "Engineering Aspects of Architectural Lighting," and "The Retail Shoplighting Market." The plan followed so successfully in London of inviting someone well known locally to open discussions was adopted amongst those who officiated in this way being Mr. H. H. C. Thomas (Superintendent Inspector of Factories for Scotland), and Mr. E. J. Stewart (Inspector of Lighting, Glasgow).

## I.E.S. Annual Dinner

Trocadero—March 16th

Will You Be There?

# Light in Daily Life

## (V) Light and Work

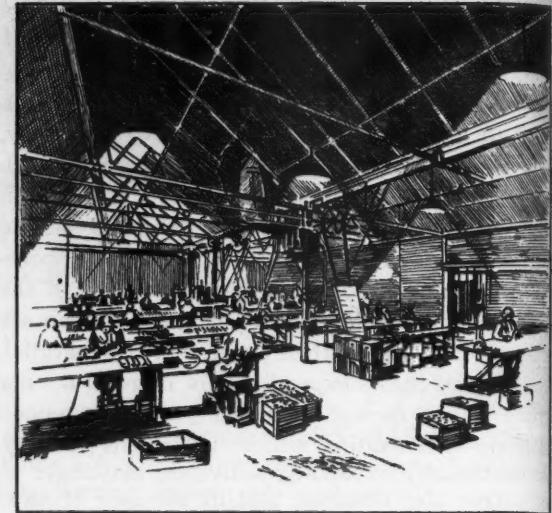
**Individual Effort and Mass Production—The Time Element—Admission of Daylight—Legislation on Lighting—General Lighting of Workshops—Intensive Local Lighting with Miniature Units—Needs of Special Processes—Improvement of Contrast—Lighting Operating Tables—Trades Involving Colour-Matching—Artificial Daylight—Lighting for Artists and Dentists—Special Effects of Electric Discharge Lamps—Separating Dross from Good Coal.**

In its broad sense the term "work" covers all human endeavours and occupations, some of which (e.g., on the railways) have already been touched upon, whilst others (associated with the home, the stage, exhibitions, and spectacles, etc.) might well be reserved for special comment later on. To keep the subject within the bounds of a single article, therefore, let us restrict ourselves mainly to familiar clerical and industrial operations. A very considerable proportion of the world's work consists in reading and writing, and for such work it will be sufficient if the conditions of good light recently set out under the heading "Light and Sight" are kept in mind. But industrial operations are more complex and varied.

Looking back over the history of human labour one is struck by certain broad tendencies. One of these is the tendency as civilisation develops for joint effort and mass production to replace the individual performance of the craftsman. To all such generalisations there are exceptions. It might be urged that workshops and factories of a kind, and engaged on repetition work, were usual in the East long before Western civilisation had developed; that such primitive tasks as the building of immense Aztec temples, or the even more gigantic pyramids of Egypt, are believed to be the product of slave labour on a vast scale. But, in a sense, such cases support the issue, for the civilisations with which they were associated had reached what was, for that period, an advanced stage.

### The Time Element.

Another step is the increasing importance of the time element in production. So long as work was mainly a matter of individual craftsmanship, there was a disposition to put excellence first, to "take one's time," if by so doing the quality of work ultimately gained. This, one may imagine, was characteristic of the building of the great churches and cathedrals of the past. Relatively minute decorations



were sometimes the labour of years. The exquisite penmanship and ornate decorations of ancient manuscripts reveal the same tendency.

A third consideration—and one of primary interest to us—is the development of artificial lighting, which during recent centuries, at least, has kept pace with the tendencies mentioned above. In early days it was unusual to attempt any but the simplest form of work when night had fallen. "The night cometh when no man can work" may originally have referred to agricultural operations; but it held good, almost literally, for most other occupations. No doubt, individual enthusiasts would sometimes work on into the night by the aid of the primitive lamps available—just as prehistoric man may have amused himself by doing a little carving by the light of the campfire—but, generally speaking, the hours of darkness were not seriously considered as a working period.

### The Importance of Daylight.

When one considers how dependent the workers of the past were upon daylight it is a little singular, at first sight, that so little regard to admission of natural light was paid in the design of ancient buildings. One must remember, however, that, even in modern buildings, design of window space is a compromise between requirements for heating, lighting, and ventilation. When glass was not available there was, no doubt, some excuse for not making apertures for the admission of light—and rain and wind—too great; whilst even at a much later period, when glass had become familiar and not unduly costly, its cooling effect on the interior was a consideration.

Of recent years admission of daylight has become a dominant factor in the design of schools and factories. The latter, in fact, tends to become merely a shell supporting glass windows. It is not impossible that even the walls of many future buildings may be composed of the new translucent bricks. Even by such special measures the percentage of full daylight

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available from an unobstructed white sky, received indoors is much less than might be supposed, whilst in interiors, for which no special precautions are taken, we may be fortunate if we get as much as  $\frac{1}{4}$  per cent. at the back of the room. In basement offices and in many other rooms where work by natural light proceeds regularly the percentage of "full daylight" received may be much more minute!

When to this condition is added the facts that daylight varies immensely according to the time of day and period of the year, that as one recedes from the windows the illumination diminishes very rapidly, and that even when a large expanse of white sky is visible through the windows this exceptionally favourable condition from the standpoint of illumination may have the drawback of producing an undesirable contrast in the case of persons facing the window it will be realised that daylight illumination indoors is very different from unrestricted daylight out of doors, and is often very far from perfect. It is with this "second best" daylight that artificial lighting should be properly compared.

#### Legislation on Lighting.

There has hitherto been no general requirement of adequate lighting for factories and workshops in this country, though regulations do exist stating requirements in general terms for underground premises and in premises where certain trades that are dangerous or involve the handling of poisonous materials are carried on. In other countries—for example, in certain of the United States of America—detailed codes of factory lighting exist. Whether it is expedient to prepare such specific regulations in this country is, perhaps, open to doubt. There is, however, a widespread view that a requirement of adequate lighting in general terms ought to be included in the Factory Acts—and provision for this is made in the new Bill, introduced in the present month. The reports of the Home Office Departmental Committee on Lighting in Factories and Workshops, issued in 1915, 1916, and 1921, contained useful recommendations. A valuable addition last year is the "Recommended Values of Illumination," issued by the Illuminating Engineering Society.

During the twenty odd years that have elapsed since the issue of the above reports the Factory Department of the Home Office has done much, even without the aid of legislation, to bring about improvements in the lighting of factories. Although appalling conditions are still sometimes found in the older factories, newly erected modern factories are almost always relatively well lighted.

In the case of offices, the condition is broadly similar. In the imposing blocks of modern offices which have sprung up during recent years the lighting is almost invariably good, but in the older premises, especially in congested city areas, deplorable conditions may be found. The fact that offices are not

liable to official inspection in the same manner as factories may sometimes result in conditions that never should be tolerated.

In regard to schools, conditions are imposed by local educational authorities. It seems, however, that in regard to artificial lighting there are no generally recognised standards, and that even in regard to natural lighting, such fundamental conditions as those prescribed in the I.E.S. report on the subject are not widely known.

It is chiefly in the case of new schools that really satisfactory conditions can be imposed. Only very limited improvements in natural lighting are usually possible in old buildings.

#### Local and General Lighting.

The use of artificial light in factories has undergone transformations, broadly corresponding with the changes in industrial methods. Before the industrial revolution each individual worker had his own light, and the conditions were often extremely primitive. It is remarkable how much was achieved by the light of a candle, or even by the rushlights and pine splinters seen in operation in old prints. But as workers came to be assembled in factories and conditions approaching the mass-production of to-day were realised, general lighting of the entire room became usual. This practice tended to become standardised as more efficient illuminants were introduced and it became economically possible to provide a reasonably high general illumination. Such general lighting will answer well wherever numbers of workers are engaged on similar tasks of a relatively simple character. In the modern office well-diffused general lighting also tends to render unnecessary the special treatment for individual machines. Emphasis may, however, be placed on the need for good diffusion of light, such as is secured by making use of reflection from walls and ceilings. This is effective, not only in eliminating troublesome shadows of the hand or body, but also in mitigating direct reflection of light from shiny glazed paper—a very common source of trouble in offices when light is imperfectly diffused and sources are injudiciously placed. In industrial operations, also, this reflection of bright objects in highly polished surfaces is apt to prove tiresome. A good instance is afforded by the glittering effect of newly cast printers' type. Owing to the exacting nature of the work a high illumination has long been recognised as necessary for the work of typesetting by hand. But the avoidance of this form of glare is equally vital. In the United States specially designed fittings giving a powerful illumination, but incorporating screened sources of considerable area and low brightness, have been designed. Low brightness of the source is the best means of diminishing excessive brightness of the reflected image.

The number of operations that can be treated by general illumination is very considerable. It has,

however, come to be recognised more and more during recent years that there are many cases in which a partial reversion to the individual lighting of the past is helpful—concentrated local lighting being applied in addition to moderate general lighting throughout the room.

#### Intense Local Lighting.

Where general lighting suffices all that is necessary is to meet the fundamental requirements of good lighting already set out by providing sufficient illumination, and placing or screening sources in such a way as to reduce glare to a minimum and obliterate troublesome shadows. Shadows cast by the body of the operator are apt to prove troublesome whenever it is necessary to inspect things closely. (It is worth noting that when the lighting is highly diffused no apparent shadow may be visible and yet the body may be cutting off a considerable amount of light.) Shadows cast by moving objects are particularly distracting.

One great advantage of supplementary local lighting, with a well-screened source placed between the operator and the work, is that extraneous shadows can be largely obliterated. Local lighting again proves useful when it is expedient to improve conditions of contrast. It has been pointed out, for example, that when work is done on very dark material (black cloth or leather, for instance) general illumination with light surroundings may fail in its effect, the working material being inevitably much darker than the surroundings, even if the illumination is high. In order to make such material the brightest object in the field of view, as it ought to be, local lighting is necessary. A somewhat similar case, of "reversed contrast," when a guard-frame appears brighter than the work it shields, has been recently pointed out by Mr. E. W. Murray. This effect can also be corrected by introducing a small screened source between the guard and the work. Other opportunities for the use of local lights occur in the case of intricate and bulky machinery, such as is used in textile and printing work. It is frequently necessary to watch what happens closely at a certain spot, to which general lighting can scarcely penetrate. Local lighting must then supply the necessary illumination and help to concentrate attention on the point illuminated. For these and similar cases miniature lamps and reflectors are available. These miniature units may be fed from a transformer working from the main supply, and the low voltages used in such cases remove any danger of shock. In some cases the small lighting unit is incorporated in the framework as an essential item in the design of the machine.

#### Requirements of Special Processes.

It may also happen that some special form of lighting is needed, not so much in order to secure high illumination as to obtain the right conditions of diffusion or shadow. This occurs, for instance, in many forms of inspection. During the Great War special

local units that could be inserted inside the shell cases were found necessary, as general lighting could not penetrate into the cylinders. The examination of leather skins is another case in point. It has been found that dark and light skins require quite distinct methods of lighting. Occasionally, very oblique rays of light coming from an intense source of small area are necessary in order to show up irregularities of the surface; in other cases (notably the inspection of highly polished surfaces for minute flaws) diffused light from an extensive area is desirable.

The work of the surgeon calls for what is perhaps one of the most interesting forms of local lighting in which exceptionally high illumination is combined with light that is "shadowless" in the sense that troublesome shadows of the hands of the operator are, so far as possible, eliminated. As, in this instance the source obviously cannot be introduced between the person of the operator and the working material, very special design is necessary.

#### Colour Effects.

There are, again, cases in which colour of the light is the most important consideration. The best example of this is afforded by those trades in which more or less, accurate matching of colours has to be practised. In the dyeing industry a high degree of precision is demanded. It was formerly assumed that accurate work could only be done under the natural light of a north sky, and work was frequently held up on foggy and misty days. In such a matter it is in fact dangerous to rely on a source of light as capricious as is daylight in our northern latitudes. There are now available sources of "artificial daylight" obtained either by filtering light from artificial sources through accurate glass filters, or by making use of the light yielded by tubes of carbon dioxide subjected to an electric discharge. In both cases a close resemblance to north sky daylight is claimed to be obtained. Apart from the trades specifically concerned with the production of pigments or coloured objects, there are many cases, such as the grading of hops, flour, and tobacco, where imitation of the effect of daylight is of considerable help to experts engaged in judging material. There are other situations in which a less accurate imitation of daylight is all that is desired, and this can be obtained by the use of screens of a less accurate character but transmitting a better percentage of light.

In certain fields of professional work, such as those of the artist, the dentist, and the physician and surgeon, imitation of daylight is again a help. To the artist the provision of an artificial substitute for daylight would seem a special boon, and dentists now habitually use colour-corrected lamps which help them to extend their hours of work to periods when daylight is past its best.

To the medical man, likewise, it would seem an aid to diagnosis to have an artificial illuminant

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Fig. 1.

Fig. 3.

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revealing colours in substantially the same manner as daylight.

#### Effects of Electric Discharge Lamps.

Apart from uses of artificial daylight, much interest has been taken in the effect of some of the newer sources of light, such as the mercury vapour high-pressure electric discharge lamps. Already the unusual quality of light (the red component is, if not quite absent, notably weak) from such lamps has

been found advantageous in certain industries. It is stated, for example, to have proved useful in foundries, and in assisting the separation of dross from coal in mines. It would not be surprising if special industrial applications for other forms of spectra (for example, that furnished by the sodium and neon lamps, yielding respective orange and red light) were discovered.

(To be continued.)

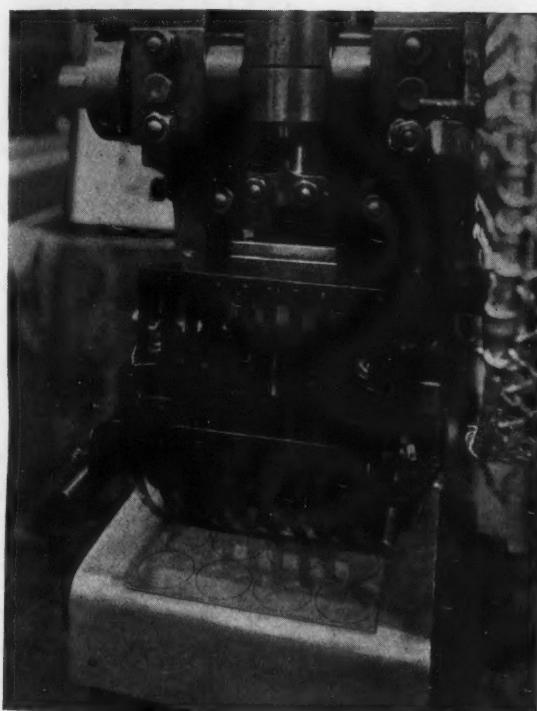


Fig. 1. Here the worker looks through the screen at the work, which receives no special illumination.



Fig. 2. The addition of local lighting behind the screen makes all the difference to the appearance of the work.

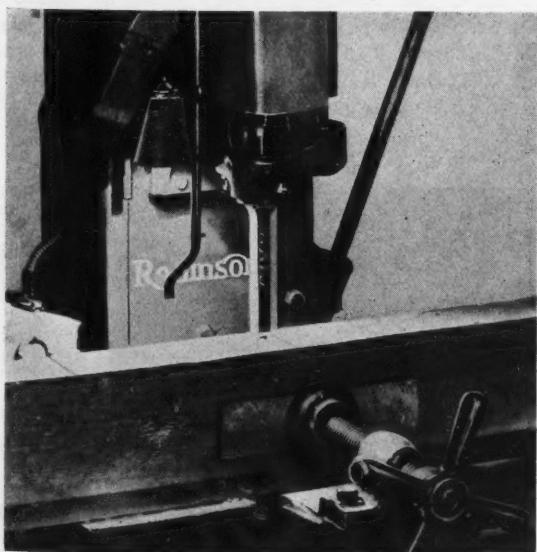


Fig. 3. Showing the value of local lighting for a mortise chain grinding machine.

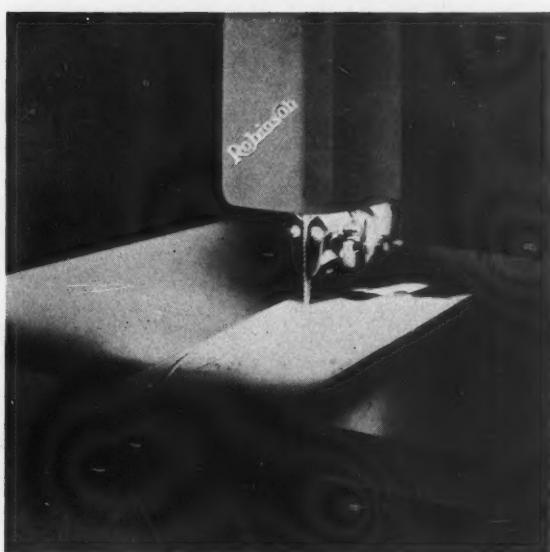


Fig. 4. A Band Saw likewise furnished with local lighting from miniature unit.

### Some Instances of the Utility of Local Lighting

(The above striking pictures appeared in Mr. E. W. Murray's recent paper on Factory Lighting and Accident Prevention [Trans. Illum. Eng. Soc. (London); Vol. II., No. 1, Jan. 1937].)

# Colliery Lighting

At the meeting of the Illuminating Engineering Society on January 12, Mr. J. W. Howell read an informative paper on Colliery Lighting, of which a summary is given below. Much of the discussion centred on the relative advantages of "mains lighting" and lighting from individual miners' lamps, which was illustrated by an imitation of actual conditions in a colliery. There were also demonstrations of other special points, such as the greater ease with which refuse can be picked out from the coal on the picking belts, by the aid of light from the electrical discharge lamps.

In the introductory portion of his paper Mr. Howell remarked that the lighting of mines is one of the most difficult problems in industry. To the frequent presence of fumes or inflammable gas must be added the transient nature of the workings—which are constantly changing as coal is removed—and the very dark nature of the surrounding surfaces, which reflect little light.

## Surface Lighting.

It is not, however, merely a matter of providing lighting underground. Good light at the pithead and for surface working is equally important. The safety of those below often depends upon the efficient operation of surface plant. The Coal Mines General Regulations (Lighting), 1934, require sufficient and suitable lighting in every place above ground where persons regularly work. Until recently, however, artificial lighting in most pithead shops has been poor. Owing to the prevalence of dust and acid fumes, specially treated fittings should be used. Maintenance (often practically nil) is here of special importance.

Apart from the precautions arising from the presence of dust and acid fumes, much surface lighting resembles general industrial practice. Boiler houses, where the atmosphere is relatively free from dust, etc., and where an illumination of 5-10 foot-candles should be provided, present no great difficulty. On wagon roads, where head room is limited and where there is usually considerable dust, bulk-head fittings, with a wide lateral distribution, are recommended. Illumination of not less than 2-4 foot-candles should be available.

## Lighting Picking Belts.

On picking belts colour-correction of the light is necessary, in the case of most forms of coal, in order that the coal be separated from refuse. Coal is very frequently stratified with bands of shale, the presence of which in fuel is very objectionable, and which should be removed if possible. "Daylight blue" incandescent lamps have been used for this



Fig. 1. Floodlighting the Pit Head (West Houghton).

purpose in some cases, but better results are obtained from mercury electric discharge lamps, the high efficiency of which is also a recommendation. A illumination of 15 to 25 foot-candles is here desirable

For yards some form of floodlighting is expedient. Some collieries use centrally suspended fittings over rail-lines. The management frequently contend that owing to rapid corrosion lighting by proper units is impracticable. Shades, therefore, often do little more than protect the lamp from rain, and may be simply hammered out of sheet metal at the colliery. Such equipment can naturally effect little in regard to light distribution. Projectors of the non-ventilated type, impervious to dust and moisture, form a practical solution. Rail sidings and yards should be lighted to a value of 0.5-1 foot-candle. Electric dis-



Fig. 2. Showing the Lighting of the Picking Belt (Shireoaks Colliery) with mercury electric discharge lamps, which facilitate the detection of combined lumps of coal and shale.

charge lamps should be so screened and mounted as to avoid any possible confusion with railway signals.

#### Underground Illumination.

The standard of illumination below ground is still very low. In many cases mains lighting is an economical and practical proposition, and extensive developments should occur in this field. The effect of the existing regulations on this question is illustrated in Fig. 3. Most mines rely entirely on miners' hand-lamps or cap-lamps for illumination below ground, which, even with the improved lamps now available, falls far short of the ideal system. With this form of lighting excessive contrasts are created and authoritative opinion suggests that such conditions contribute seriously to the condition known as "miners' nystagmus." No fewer than 48.2 per cent. of the cases of disablement in mines notified in 1934 were due to this cause. A total of nearly 9,000 cases was recorded for 1934, and the cost to the industry in compensation was £36,754. Where better lighting has been installed there has been a marked decrease in the incidence of this complaint. Concentrated sources of light in dark surroundings inevitably give rise to glare—and this is also true of mains lighting when, as not infrequently happens, clear lamps are used in clear well glasses totally unscreened.

The recent requirements of the Mines Department should do much to improve conditions. Whitening the tops and sides of haulage roads—either by white-washing on built roadways or stone dusting on rough roadways—does much to improve visibility. Mains lighting is of considerable benefit on haulage roads and other parts of mines in which it is sanctioned by the General Regulations—for example, in diminishing the number of accidents. In the Sneyd Colliery records show that a diminution of 50 per cent. in the number of accidents followed the introduction of mains lighting. Illumination is of importance in enabling the presence of moving conveyances to be quickly recognised. It has also proved useful in enabling the metals—which were previously in darkness and liable to cause stumbling—to be easily seen and faulty rails detected. In such circumstances constant and evenly distributed illumination is very much more satisfactory than the use of individual miners' lamps. The bulkhead type of fitting, with a smooth exterior and equipped with 40- or 60-watt lamps, is specially suitable.

#### The Evil of Excessive Contrast.

It is difficult to convince users, in this as in other industries, of the need to break away from traditional methods of lighting. Yet, for coal face lighting, the mains system is the best from a visual standpoint, as it can be made substantially glare-free. With portable lamp lighting the worst characteristics of artificial lighting, as compared with daylight, are found. The miner's lamp gives only a weak illumination in its immediate neighbourhood. The surroundings are in dense darkness. The experimental work of Lythgoe has shown that the eye works most efficiently when the field surrounding the object examined is of approximately the same brightness as the object itself. Visual perception diminishes progressively when the surround becomes either darker or brighter than the object.

Consider the conditions at the coal face. A 4-volt portable lamp fed by a lead accumulator yields approximately two candlepower and will furnish, say, 0.08 foot-candles at the coal face. Assuming a reflection factor of 8 per cent. for the coal face and we have a brightness of only 0.0064 equivalent foot-candles, or 0.0000141 candles per sq. inch. Now the brightness of the filament in a miner's lamp is



Fig. 3. Coal Mining.  
Area within which fixed lights are permitted:—  
(Coal Mines Gen. Reg. (Lighting) 1934. Part II. Reg. II.)  
(1) Subsection (a) and (b).....X  
(2) " (c).....0  
(3) Special Regulation (d).....●

about 1,000 candles per square inch. With a pearled funnel glass this is reduced to about fifty candles per sq. inch. Mr. Howell quoted tables of brightness to show that under such conditions the brightness of the fitting ought not to exceed about 1.2 candles per square inch if the contrast is not to be excessive. Actually this is nearly multiplied forty times! On the other hand, with mains lighting the 40-watt lamp can be enclosed in an opal well glass giving a brightness of only two candles per square inch, which is not very much greater than the desirable limit.

Mr. Howell showed, by a demonstration of the effect of two light sources, each of a brightness of fifty candles per square inch but with backgrounds of 0.8 and 8 candles per square inch respectively, how much greater is the sense of discomfort experienced with the greater contrast.

One of the most objectionable features of the very low order of illumination in coal mine workings is that the eye is in an abnormal condition, the central region of the retina (the fovea) being relatively insensitive. It is believed that this condition has a lot to do with the development of the oscillations of the eyeball, characteristic of miners' nystagmus. To minimise such troubles a brightness of the coal face of at least 0.01 candles per square foot is necessary. As a practical possibility Professor Statham has suggested an illumination of at least 0.4 foot-candles.

#### Diminution in Accident.

Recent tests at the Steetley Colliery have shown that a reasonable illumination is obtained with 7.8 watts per linear yard of coal face, lamps being hung from the coal face at intervals of 4 ft. 6 in. A chart shown by the lecturer revealed the important influence of the better lighting on accidents. From March, 1934, when there was no mains lighting, to October, 1935, by which time four-fifths of the coal face had been lit from the mains, the monthly record of accidents had fallen from 22 to 4—a reduction of 82 per cent. The average cost of compensation



Fig. 4. Conveyor Belt on the Coal Face, with Mains Lighting installed (Steetley Pit).

had likewise fallen by an amount equivalent to 0.3d. per ton of coal raised—which is more than the combined capital and running costs of the new installation less labour charges.

#### Improvement in Output.

A comprehensive test of mains lighting was carried out at the Wenceslaus mine (Germany) in 1927-9. From diagrams presented it was inferred that with complete mains lighting 2.32 tons of coal were raised per man-shift as compared with an average of 1.87 under the old system of lighting with safety lamps—an increase of 25 per cent. Furthermore, the quality of coal brought to the surface had improved, the waste content decreasing by 142 tons in a total haulage of 5,400 tons. At one period, June, 1928, a maximum output of 2.54 tons per man shift was reached, the waste content being also then at its lowest figure, i.e., only 3.5 per cent. of the total raised. Over a period of eighteen months the shale contents of the total was 4.7 per cent., as compared with 8.8 per cent. with the old lighting, a reduction of 50 per cent.

Unfortunately it has not been found possible to obtain such conclusive data in this country, but favourable experience at several pits was quoted. In some cases the effect of better lighting conditions on improvement in quality and lessening of the percentage of impurities has been very marked.

#### Comparisons of Various Systems.

In the concluding portion of the paper the author entered into comparisons of the costs of various systems of lighting. The question is influenced by many factors. The adoption of mains lighting is economically controlled by the thickness of the coal seam, the minimum, under good roof conditions, being 2 ft. 9 in. to 3 ft. thick. Three systems compared were:

- (1) 150-watt lamp operated at 70 volts (Wenceslaus, Germany).
- (2) 60-watt lamps at pressure of 110 and 25 volts (Steetley Pit).
- (3) Pneumatic lamps using 30-watt 12-volt automobile lamps (Langwith and Norton Pits).

The comparison depends on the manner in which costs are assessed, and on the depth of the seam in the various mines. An analysis of costs in terms of pence per ton of coal raised gave figures of 1.157 (Wenceslaus), 0.7 (Steetley), 0.92 and 0.791 (Langwith), and 0.483 (Norton). On this basis the system at the Norton Colliery would appear to be the most efficient, but if an allowance for the depth of the seam is made, the best results would appear to be gained at the Steetley face. The degree of illumination provided at the coal-face should also be considered. At Steetley and Langwith the vertical illumination on the coal-face was about 0.1 foot-candles, at Norton 0.5, and at the Wenceslaus Mine 2.1. This very high value at the German mine, coupled with the relatively high cost of current (0.6d. per unit) no doubt accounts for the high cost per ton of coal raised. It is estimated that the cost of the safety lamps is about 0.3d. per ton, but in the case of all mains and compressed-air electric lighting the advantages in the form of accident reduction, saving in skilled labour, and improvement in output and quality of coal should be weighed.

Careful consideration should be given to the benefits of coal-face lighting, either direct from the mains or by means of pneumatic lamps; the latter being exempted from the Mines General Regulations and suitable for use in fiery mines.

In conclusion, Mr. Howell expressed the belief that sooner or later handlamps, from the illumination standpoint, would become obsolete, and improved means of obtaining more and better illumination would become general in mines.



Fig. 5. Mains Lighting on the Haulage Road (Steetley Pit).

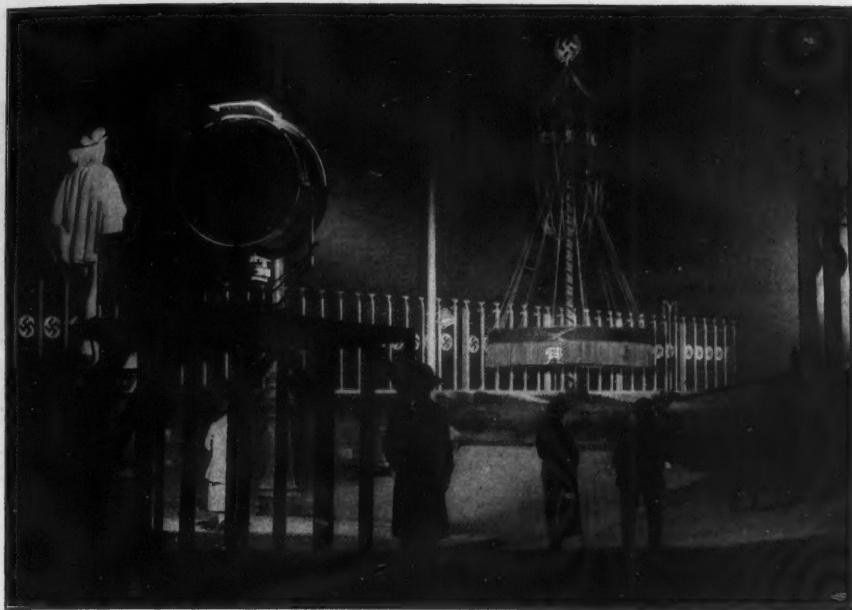
#### Some Points in the Discussion.

The president, in thanking Mr. Howell for his paper, referred to a series of exhibits of miners' lamps and mains lighting equipment arranged by the General Electric Co., Ltd. (Mr. Richards), Messrs. Siemens Brothers, Ltd. (Mr. Wood), Messrs. Hailwood and Ackroyd, Ltd., and John Davis and Son, Ltd. (Derby), which were studied with great interest by members after the meeting.

There was an informative discussion. The Society was very fortunate in hearing first the views of Mr. F. H. Wynne (H.M. Deputy Chief Inspector of Mines) and Mr. G. M. Harvey (H.M. Deputy Electrical Inspector of Mines), who contributed a useful analysis of the problems involved in mine lighting, and especially lighting from mains. One important factor is the very limited space often available at the coal-face. There may be, for example, coal-cutting machines with trailing cables, conveyors, etc. Further, the equipment for mains lighting might have to be rearranged, perhaps every twenty-four hours, in order to follow developments at the coal-face. There is, also, the fear that a spark might cause an explosion. The risk of this is known to be small with portable lamps, but in the case of mains lighting there has hardly been enough experience yet to judge. Lighting of roadways, however, is relatively a simple matter. Here the liberal use of whitewash is an enormous help.

Some of these points were again emphasised by Mr. Harvey, who pointed out that very frequently there was only a space about 3 yards wide and 4 ft. 6 in. high, where there were already props, and in which the miner had to accommodate a coal-cutter. It was difficult to get in equipment for main lighting as well. In many places the bodies of the men would obscure the light; for example, if a seam of coal went down to 14 inches! Again, it often happened that men had to leave their work to make an inspection elsewhere, or perhaps to go to the surface, for which purpose they had to take a portable lamp with them. Finally, there is a certain danger in lighting some sections of the mine brightly, but leaving others in comparative darkness, as the eyes of the miners have to get readapted to the dark conditions every time after being exposed to the brighter light.

Amongst others, Mr. Howard Long emphasised the great opportunities for improving the surface lighting, and the difficulty of getting accurate statistics from mines in this country. He also referred to the high-frequency system, demonstrated at the Institution of Electrical Engineers some years ago, for which great advantages from the standpoint of safety were claimed. There was also some reference, by Mr. Hughes and others, to new types of electric discharge lamps specially adapted to mine lighting, and such that the temperature at the electrodes would not be high enough for gas to be fired in the event of a lamp being broken.



This picture was taken in the Berlin Pleasure Gardens on the occasion of the great spectacle on May-Day last year. In the background will be seen the illuminated maypole, and in the foreground one of the searchlights by which it was lighted up.

## Floodlighting May Day Spectacles in Berlin

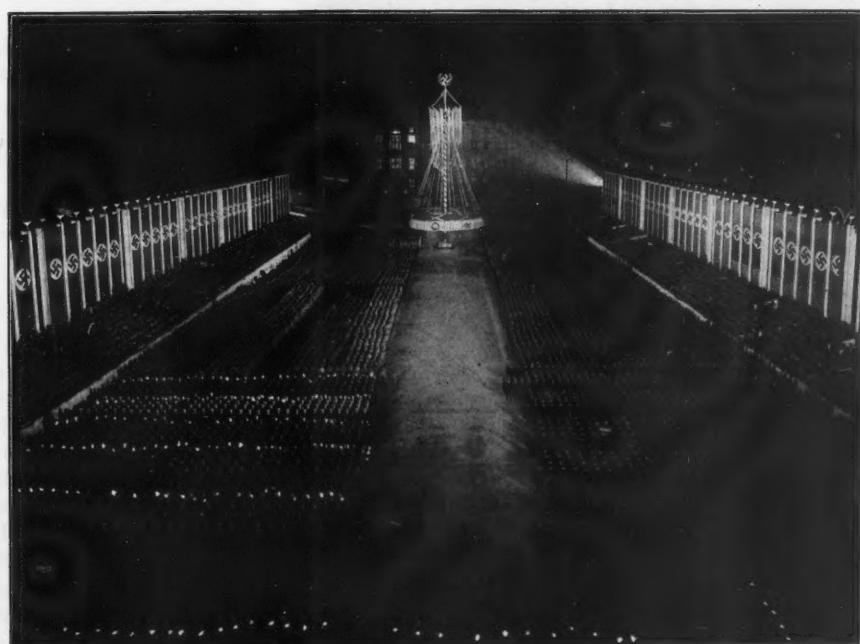
Through the courtesy of a correspondent in Berlin we have received the accompanying striking photographs taken during the May Day celebrations last year. The illumination of the gigantic maypole in the background was effected with four 300-amp. arc lamp projectors, mounted on small pedestals. Ten 150-amp. projectors of similar type, mounted on the roof of the Old Museum, served to illuminate the arena. In all, therefore, a load of 2,700 amperes was demanded. The face of the museum was also illuminated by means of 112 500-watt gas-filled incandescent lamps, which enabled the columns to appear in silhouette.

The use of large arc lamps to achieve the main floodlighting is of interest. It would seem that, in the circumstances, beams of exceptional power and long range were needed. The pictures give an effective reminder of what can be done in this way to render mass-movements striking and effective by night.

## Modern Stage Lighting Applied to Museum Groups

A contribution by Mr. R. C. Engelken to the Transactions of the Illuminating Engineering Society, U.S.A., for December describes the special lighting of museum groups in the American Museum of Natural History. In each case the animals stand amidst natural surroundings and with a background characteristic of their country of origin. Judging from the pictures, the result was impressive—far better than the conventional method of merely placing stuffed animals in glass cases. The effect was enhanced by the artificial lighting, which was evidently studied with great care, due attention being paid to the correct positions of shadows for the time of day. Different groups of units were used for illuminating animals in the foreground, for picking out objects (e.g., snow-clad mountains) in the distance, and for producing the correct effect in the middle area. We commend the idea to curators of museums, botanical gardens, etc.

Another view of the display, in which the masses of marchers are clearly revealed. This view was taken from the roof of the "Old Museum," where the large searchlights illuminating the display were mounted. In the background the illuminated maypole is again seen.



## An Outstanding Example of Industrial Lighting

We are indebted to Mr. F. L. Cator (Birmingham Lighting Section B.T.H. Co. Ltd.) for the following particulars of the lighting of the new machine shops of the Standard Motor Company with electric discharge lamps. This company has always maintained a high standard of lighting, and the present system was only accepted after it had been shown that the quality was satisfactory, besides the diminished running cost—which was in fact so reduced as to fully justify the higher initial outlay.

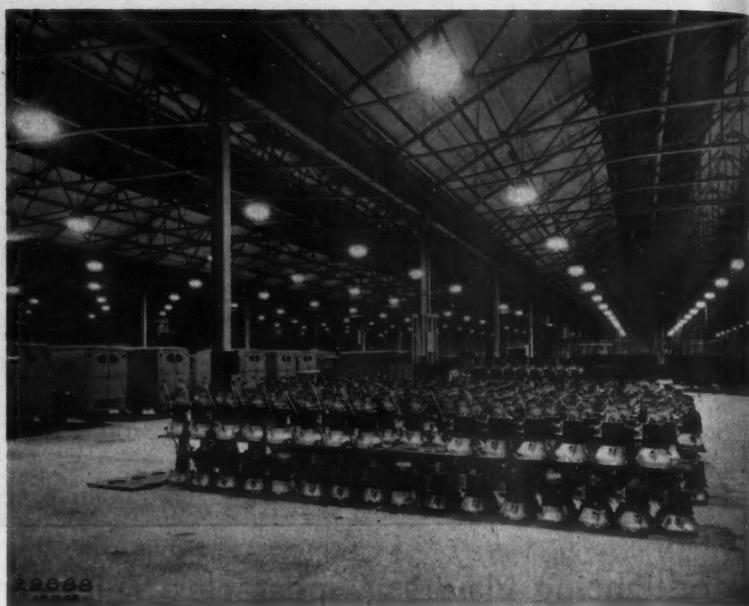


Fig. 1. Showing the general appearance of a part of the installation.

Before a decision was taken to install electric discharge lamps in their new machine shops, the Standard Motor Company, through the agency of their chief plant engineer, Mr. F. C. Johnson, carried out a series of thorough tests.

The greatly reduced running cost for a given illumination was easily proved. The decision to adopt the system was not taken, however, until the individual opinions of a number of men, working night-shifts under a trial installation, could be obtained.

The opinions of these men were definitely favourable. Interesting testimony in regard to the improved effect was given by one of them, who declared that previously, when going home after a night-shift worked under the light of ordinary tungsten filament lamps, he could never at once go to sleep. He always had to go for a walk or take some other steps towards inducing sleep, whereas, with the new system, he could get to sleep immediately after he reached home—presumably because the easier seeing conditions had left him less fatigued.

Some idea of the general features of the installation will be gathered from Fig. 1. The reflectors are of the indoor dispersive type, with a cut-off of 70 degrees from the vertical, and are mounted 17 ft. above the floor level. There are two rows of reflectors per bay, the distance between reflectors being 21 ft. across and 22 ft. along the length of the bay.

The discharge lamps are of the 400-watt type and are controlled in pairs. Fig. 2 serves to show the method of mounting the control gear on the shop stanchions, which affords easy access to fuse boxes and convenient control for each section of the lighting. The two B.T.H. 400-watt chokes shown in the upper part of the photograph are mounted together with a 40 mfd. condenser and pair of cut-outs on a steel plate, which is strapped to the roof of girder. The chokes are mounted in pairs in this manner right along the length of each bay.

The results of a series of readings taken under a typical section of the installation are shown in Fig. 3. These readings were taken after the lamps had been in operation several hundred hours and had settled down to steady working conditions. A photoelectric photometer, accurately calibrated for electric discharge lighting, was used, and each reading was obtained at a distance of 3 ft. from the floor.

Reference to the figures shows that the maximum reading is 23.5 f.c. and the minimum 19.7 f.c.—i.e., the illumination is very even over the complete area, the diversity ratio being only 1.19 to 1. To illustrate

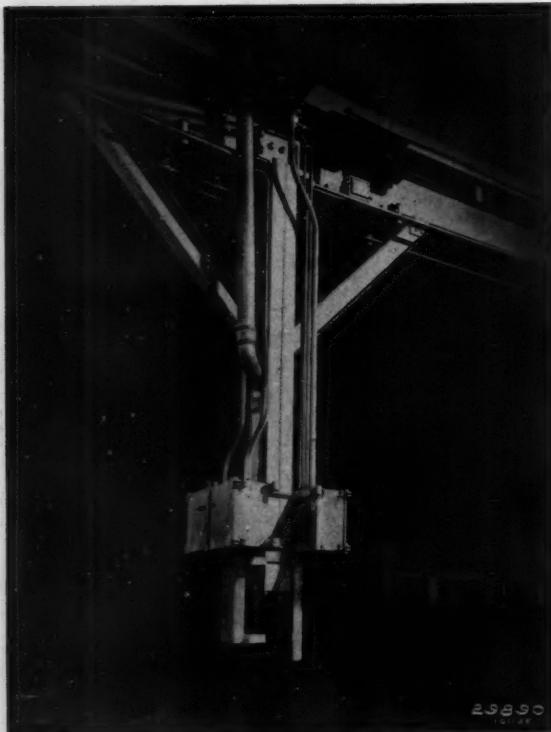


Fig. 2. Illustrating the method of mounting the control gear on the shop stanchions.

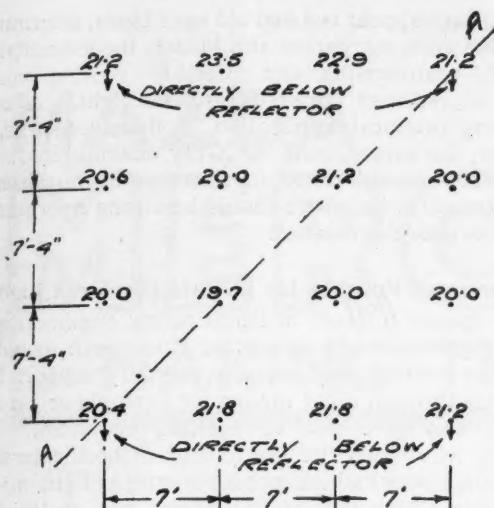


Fig. 3. Corrected Foot-Candle Readings.

further, the uniform distribution of illumination the graph (Fig. 4) has been included, using a representative cross-section between two units.

With the actual figures in front of one, it is interesting to work out the reduction factor for this installation as obtained by the lumen method. (By "reduction factor" is meant the factor by which the initial luminous output of the lamps must be multiplied to give the lumens available at the working plane; this factor, therefore, combines the candle maintenance figure for the lamp, the utilisation coefficient of fitting, the reflective factor of floor, roof, etc., and the loss of light due to distance of working plane from light source.)

The area lighted by one fitting is: (21 ft. by 22 ft.) = 462 sq. ft., assuming that one-quarter of the light from each of the four lamps falls on the area in question.

From Fig. 4 the average lighting intensity over this area is 20.9 f.c.

Taking this initial luminous output of the 400-watt Mazda Mercrea lamps at the published figure of 18,000 lumens and substituting in the formula—

$$L \times X$$

$$I = \frac{L \times X}{A}$$

gives X the reduction factor as 0.536 for this installation at the time the readings were taken.

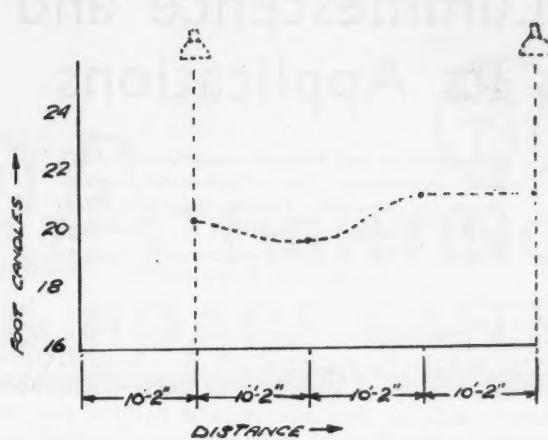


Fig. 4. Foot-Candle Readings plotted along Section A-A in Fig. 3.

In conclusion, the wattage per sq. ft. necessary to give this exceptionally high illumination is worth noting. Taking into account the small watts loss in the B.T.H. chokes, this works out at 0.91 watts per sq. ft., a very much lower figure than would be required were ordinary tungsten filament lamps employed.

## When Lamps Should be Renewed

An interesting point was raised by Mr. L. E. Buckell in the course of his recent address in connection with the E.L.M.A. 34th Illumination Design Course. He pointed out that the main features of a lamp were: (1) Lumen output throughout life; (2) consumption of electricity; and (3) life. The latter factor is one that deserved study. Mr. Buckell insisted on the necessity for organised maintenance. If the process is carried out chaotically—lamps being merely replaced whenever they happen to break down—the cost of the process may be out of all proportion to the work involved. He recalled the case of a large industrial installation, where the cost of changing a single lamp might work out to more than 1s. 6d., and there was one street lighting authority that calculated that a single lamp renewal cost 14s. 6d. Such excessive costs could be avoided by using lamps of good quality and changing them according to a fixed and systematic routine.

## The Ideal Home Exhibition

Further particulars now available of various devices and decorations at the forthcoming Ideal Home Exhibition support the belief that light will play an important part in this show, which is, more than ever, mainly an appeal to the eye. The focal point in the Golden Hall will be a statue of King George VI., more than 15 ft. in height. On either side will be a panoramic cavalcade of the peoples of the British commonwealth of nations—these figures being also twice lifesize and set in three planes so cunningly illuminated as to give the impression of being carved in solid gold. Floodlighting will diffuse over the hall a golden mist.

Other items include "Rooms of the Monarchs," "Kitchens of the Nations," "Gardens of Great Lovers," etc.—something for everyone!

## Honours for Mr. Waldo Maitland

We learn with interest that Mr. Waldo Maitland has been elected a Companion of the Institution of Electrical Engineers—an honour reserved mainly for those who, whilst not electrical engineers by profession, have rendered important services to electrical engineering. Mr. Maitland has always occupied a somewhat special position, that of an architect who has made a special study of illumination. His services are fully recognised by the Illuminating Engineering Society—he is a Member of Council—and one is glad to see recognition in other quarters. We understand that Mr. Maitland has recently been officially appointed, by the Cunard White Star Line, lighting consultant for the sister ship (No. 552) to the Queen Mary. He will be working in collaboration with Mr. G. Grey Wornum, F.R.I.B.A., who will be responsible for the main part of the decoration.

# Luminescence and Its Applications

**Fluorescence and Phosphorescence—Stokes's Law—Substances that Fluoresce—Fluorescence for Analysis—Testing Eggs and Margarine—Fluorescent Coatings for Discharge Tubes—X-Ray Screens—Fluorescent Glasses—Screens for Television.**

In an informative paper read before the Royal Society of Arts on January 27, Mr. J. T. Randall traced the work of early workers in the fields of phosphorescence and of fluorescence, and pointed out the fundamental difference between the two processes ("phosphorescence" being a glow which persists after the stimulus is withdrawn, whilst "fluorescence" exists only during the period of the stimulus). The theory of the subject was explored by Becquerel and Stokes, the latter of whom defined the law asserting that it is impossible to obtain fluorescence radiation of shorter wavelength than the incident radiation. In general, this is true—i.e., we would not expect to get blue fluorescence with green light—but under certain conditions apparent exceptions occur.

## Fluorescent Materials.

Mr. Randall next discussed in turn the chief varieties of luminescent materials such as (1) pure inorganic solids, (2) impure inorganic phosphors, (3) pure organic compounds, and (4) disperse organic systems. Special interest attaches to the second class, of which zinc sulphide is an important example. The addition of a minute trace of copper (say, five parts in 100,000), followed by suitable baking, gives rise to a material which fluoresces a vivid green. The colour of the glow may, however, be varied very greatly by altering the impurity. It was shown how the presence of silver produced blue fluorescence, copper, green; gold, blue-white; manganese, deep yellow; and a mixture of copper and silver, blue or greenish white. Another interesting special case is the influence of the activating impurity on the fluorescence of a solid solution of zinc and cadmium sulphide. The colour of the glow may pass through the range of green, yellow-green, yellow, orange, orange-red, and brick-red as the percentage of cadmium sulphide is increased.

Of the pure organic compounds, anthracene and benzene are instances of fluorescing substances, whilst in the fourth group are materials, such as rhodamine and uranin, which only become strongly fluorescent when in solution.

Generally speaking, the spectra of luminescent materials consist of broad bands, and it is only in exceptional cases that strongly marked lines occur. By means of the familiar experiment with a rotating drum, the author showed the nature of duration of phosphorescence from various substances and presented curves illustrating the rate of decay of the luminous effect. The marked effect of heat and exposure to infra-red radiation, in quenching fluorescence, was also shown.

## Applications of Fluorescence.

After touching upon one or two special forms of luminescence, such as "flame-luminescence" and "thermo-luminescence," the author discussed the theory of luminescence at some length. He then passed on, in the final and most interesting section of the paper, to its applications.

Amongst the miscellaneous applications of fluorescence as a basis of analysis were the testing of eggs

(fresh eggs appear red and old eggs blue), discrimination between margarine and butter, the examination of old manuscripts, and illegible writing which may be restored under ultra-violet light. A very striking practical application of fluorescence is, of course, the screen used for X-ray examinations. An important consideration in this case is the absence of after-glow, i.e., there should be strong fluorescence, but no phosphorescence.

## Fluorescent Powders for Electric Discharge Lamps.

Of special interest in illuminating engineering is the application of coatings of fluorescent powders to tubes containing fluorescent mercury vapour. Discharges through other media, for example argon and neon, also give rise to exciting radiation. The author mentioned the use of zinc orthosilicate with argon-mercury which produces green light and a luminous efficiency of 36 lumens per watt. The same material used with high efficiency neon gives yellow light and a luminous efficiency of 22 per cent. In the case of high voltage fluorescent discharge tubes, the two combinations mentioned above have yielded efficiencies as high as 40-80 and 25-30 respectively. Fluorescing calcium tungstate (blue) combines with the natural neon colour to give an effective pink. The results attainable with neon are the more interesting because the efficiency at the end of several thousand hours is as great as at the beginning, whereas mercury tubes fall off during life to some extent.

The application of these fluorescent powders to the new high pressure mercury discharge lamps is of great interest. Zinc-cadmium sulphides will not only withstand the more stringent conditions imposed by such lamps, but may be placed on the inside of the outer jacket—a material advantage in keeping them clean. The amount of red radiation has thus been increased relatively from less than one to five and a half. If, on the other hand, a green luminescent silicate is applied the light is naturally a bad colour, but an efficiency about 30 per cent. greater than that of the normal lamp may be obtained.

## Fluorescent Glasses.

It would appear that glasses cannot yet be produced with such colours as to render the use of fluorescent powders unnecessary. Fluorescing glasses, based on the exclusion of practically every trace of iron, have, however, recently been developed abroad. At present a mercury discharge is used to excite the tubing. It appears that the efficiency attainable is less than can be secured in cases where the fluorescing material is applied as a coating to the interior of the tube instead of being incorporated in the glass itself.

## Television.

A final application of luminescence discussed in the paper was the cathode ray tube, so much used with the television sets of the present time. A problem in this case is the production of a screen capable of fluorescing a pure white, for which purpose two or more zinc-cadmium sulphides may be combined.

## ERRATA

We regret that in the description of the Photo Lamp Unit exhibited by Mr. Harold Bright at the opening meeting of the Illuminating Engineering Society ("Light and Lighting" January, 1937, p. 14), the extent of the overrunning was incorrectly stated. The filament is actually overrun by 70 per cent.

# MAZDA MERCRA IS MAKING THESE ROADS SAFER



THE recent important contracts referred to below, together with many earlier ones, and others not yet begun, indicate that where accident-proof lighting and economical operation are the chief considerations, BTH equipment is chosen.



## THE BTH DILEN LANTERN

is manufactured in two sizes, one, a large size as used for West Ham and Wembley suitable for 250 or 400 watt Mazda Mercra Lamps, and, two, a smaller size for use with 150 watt Mazda Mercra Lamps.

## WEST HAM

### 700 BTH DILEN LANTERNS

700 BTH Dilen Lanterns and 700 Mazda Mercra Lamps, together with auxiliary equipment, are being supplied for improved street lighting at West Ham. The units will be erected on existing trolley-bus standards.

## WEMBLEY

### 300 BTH DILEN LANTERNS

A further order for 173 complete units comprising Mazda Mercra Lamps, BTH Dilen Lanterns, auxiliary gear and standards, is now being executed in conjunction with The North Metropolitan Electric Supply Company for the improved lighting of the following thoroughfares:—

Fryent Road	Bridgewater Road
Park Lane	Salmon Street
Harrow Road (continuation)	

This order, with the 127 lanterns already installed on the Harrow Road, makes a total of 300 BTH Dilen Lanterns supplied to Wembley.

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## Brighter Lighting—But Less Glare!

The Institute of Ophthalmic Opticians held their annual dinner on January 21, when Mr. Cunningham, president of the Illuminating Engineering Society, was asked to reply for the guests.

In the course of his remarks he referred to the conjunction of Better Light and Better Sight which was very prominent nowadays, and reminded his audience that although the slogan might be a new one, the connection between illumination and good eyesight was one that had been recognised by the Society from its very earliest days. The problems of glare and of suitable illumination intensities for various visual tasks were always in the forefront of their work. Although in the past they had been largely concerned with increasing the standards of illumination to make them more adequate for general purposes, he thought that the saturation point might presently be reached if one could judge by the high order of intensity already provided under certain canopies of cinemas and suchlike bright spots. In particular, increase in illumination should not be accompanied by increase in glare. It would, indeed, be ironic that, if after the illuminating engineer had complied with the request of the optician for higher intensities of illumination, he should eventually have to go to the optician and ask the latter to provide suitable dark glasses, so that his eyes could stand the extreme brilliance of up-to-date lighting!

## Some Aspects of Architectural Lighting

A meeting of the Dublin local centre of the I.E.S. was held on Tuesday, January 12, at 8 p.m., in the Institute of Civil Engineers, 35, Dawson-street, when a lecture, entitled "Some Aspects of Architectural Lighting," was delivered by Mr. R. O. Ackerley, of the General Electric Co., London. Mr. F. X. Algar presided.

There was a very good attendance of a representative character, including architects, engineers, consulting engineers, contractors, trade, etc., and a full attendance of all the members of the local centre.

Mr. Ackerley in his preliminary remarks defined architectural lighting as "That form of lighting which, when built into the structure, formed an essential part of the decorative scheme." He stressed the necessity of close co-operation between the architect and the illuminating engineer to get the desired effects, and remarked that a mutual understanding of their difficulties would help greatly towards this co-operation.

In matters of taste or form, beyond certain well-defined lines, it was, he said, largely a matter of opinion; but in matters of scientific fact it was very

## New Gas Lighting at West Hartlepool Station



The lighting of the London and North-Eastern Railway Station at West Hartlepool has been completely modernised, and the illustration shows the effect of the platform lighting after reconstruction. The new lighting, which consists of over eighty modern gas lamps on platforms, etc., and about forty lamps in rooms and offices, is switch-controlled throughout.

The railway company has also brought the gas lighting of the station in the neighbouring Borough of Hartlepool up to date, some thirty-five modern lamps replacing the old units on the platforms.

different. The illuminating engineer had to deal with light sources and controlling equipment, which had certain physical dimensions and properties, and he had to obey certain laws in order to get effective results.

The lecturer then very clearly described by means of slides the effects of the cosine and inverse square laws as applied to cornice lighting, etc. Then followed a whole series of slides showing some very effective and beautiful examples of architectural lighting.

Mr. Ackerley replied to various points raised in the discussion, and in conclusion was accorded a very hearty vote of thanks, which was proposed by an electrical engineer and contractor (Mr. McConnell) and seconded by an architect (Mr. F. J. Ryan) and a consulting engineer (Mr. O'Reilly).

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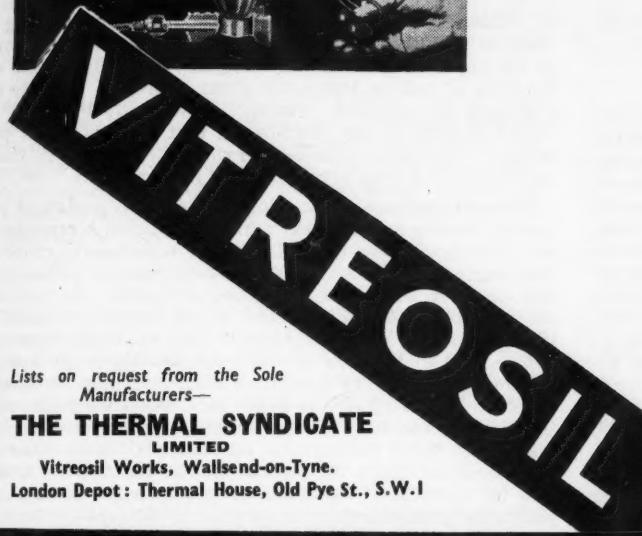
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### Home Lighting

At a meeting of the North-Western Area Local Centre of the Illuminating Engineering Society, on January 5, Mrs. M. Pender Chalmers gave a talk on Home Lighting. A number of members of the Women's Electrical Association attended. The address contained a number of hints illustrated in the familiar small book on this subject by Mrs. Pender Chalmers, in which the treatment of the various rooms in the home is discussed in turn.

In the course of the discussion a number of interesting points were raised. Mr. Hawkins, for instance, pointed out the disparity that often existed between an illumination which a man might consider "quite comfortable," and what he would actually select for himself if free to do so. Mr. Proctor was inclined to think that some of the suggestions in regard to home lighting were rather ambitious and beyond the average consumer—but Mrs. Chalmers did not agree. She thought, for example, that in the average room an enclosed flush ceiling fitting and a "Study Lamp" would not be excessive for most consumers, and would give excellent results. Mrs. Hawkins raised a familiar domestic objection to indirect lighting—that it showed up slight faults in the ceiling

rather badly. Mrs. Chalmers, however, contended that this was a virtue rather than a vice!

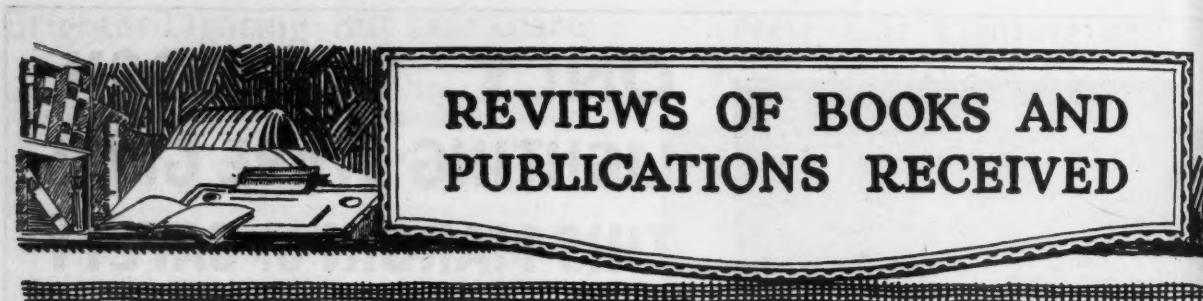
At the conclusion of the meeting a vote of thanks to Mrs. Chalmers for her address was moved by Mrs. Carr (chairman of the Manchester Branch of the E.A.W.), seconded by Mr. K. Smith, and carried with acclamation.

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**Mr. R. C. Hawkins:** now Chairman of I.E.S. North-Western Local Centre

On January 5, at a meeting of the local I.E.S. Committee in Manchester, Mr. R. C. Hawkins was elected chairman, in succession to Mr. A. E. Jepson, who has now been transferred to London. A letter has been sent to Mr. Jepson thanking him for this continuous and enthusiastic service on behalf of the local centre.



*"A Text-Book of Illumination."* By William Kunerth, Ph.D. (Chapman and Hall, London, 1936. Pp. 276: Figs. 110. Price 15s.)

This work, now in its second edition, is the outcome of a course given at Iowa State College (U.S.A.). The original plan, which covers a wide ground, remains substantially the same. There are 18 chapters, dealing with such matters as photometry, electric illuminants, and various applications of light, and—this is a special feature of the book—a final supplementary chapter containing suggestions for laboratory experiments. After a preliminary survey of mean spherical candlepower, illumination measurements, brightness, etc., there are sections devoted to street lighting, daylight, industrial and residence lighting, and the lighting of shops, offices, and public buildings. One or two new developments which are mentioned in the new edition, such as electric discharge lamps and photometers of the physical type, might with advantage be more fully pursued. In the next edition fuller practical developments of discharge lamps should be available, and the special difficulties attending the use of photo-electric cells, i.e., their peculiar response to light of different colours and their departure from the so-called cosine law, might well be illustrated in fuller detail. Furthermore, as the work is not intended to be confined to electrical illumination, fuller reference to modern gas lighting might be made. In the chapter on Daylight, again, some idea of the daylight factor desirable in schoolrooms, etc., might be given. At the end of each chapter there are references to sources of fuller information. These will no doubt prove useful to students, though one gets the impression that they are mainly confined to the Transactions of the American I.E.S. and a few American journals. The bibliography on street lighting might, for example, be extended to give some insight into European practice and the problems involved in the framing of the British Standard Specification, the creation of uniform road brightness, and the study of the various factors influencing visibility.

*"Etude de l'Efficacité des Projecteurs au travers d'Atmosphères Non Limpides."* By A. Monnier, with a preface by André Blondel. (Sauvion et Lelièvre, Paris, 1936; pp. 141); *"Recherches sur les Propriétés Physiques et les Effets Physiologiques d'une Lumière Colorée."* By Marcel Mouton. (Sauvion et Lelièvre, Paris, 1935; pp. 95.)

These two works may conveniently be taken together. They illustrate a definite tendency in France, namely, the publication of monographs on specialised topics, such as the effects of coloured light, in which these two authors are interested. M. Monnier deals with his subject in a series of six chapters, in which the researches of other authors are recorded, the varied atmospheric conditions described as misty or foggy are analysed, the author's own tests are set out in detail, and, finally, his conclusions summarised. Briefly it may be said that the book is a plea for the use of yellow screens in automobile headlights. The author contests the view expressed by the International Commission on Illumination, and subsequently confirmed by the well-known researches of Dr. Stiles in this country, that the use of beams of coloured light presents no advantage under foggy conditions. If one seeks for an explanation for this difference in view one finds at least one complexity that deserves exploration: that whilst Dr. Stiles was concerned with the simple problem of penetration of the atmosphere, M. Monnier takes into consideration physiological factors. He suggests, for example, "an important diminution in the threshold of differential perception

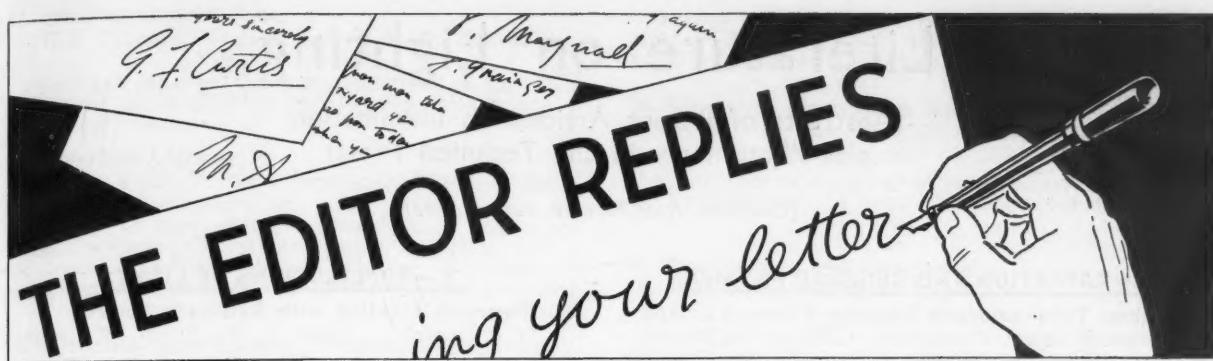
in yellow light." (The idea seems to have something in common with that evolved by Prof. G. B. van der Werfhorst, in his paper at Cheltenham last year, when discussing the qualities of sodium lamps for street lighting.) Another explanation of difference, charitably offered by Professor M. André Blondel in the preface, is that in a "London particular" (*les épais brouillards anglais*) variations in transparency with colour are less easily distinguished.

The other volume, by M. Marcel Mouton, is presented in a similar concise manner, preliminary enquiries, summaries of tests and conclusions being dealt with in successive chapters. His conclusions in regard to the advantages of yellow light are, however, expressed even more definitely. He suggests for example, that for equality of acuteness of vision an illumination by yellow light half that by white light will suffice, that in the case of motor-car headlights an increase in range of 15 per cent is attainable, and that the fatigue involved in reading type is 30 per cent. less when yellow light is used. Incidentally the author makes one statement that we do not recall having ever encountered before—that the brightness necessary for the visibility of an object is always less for subjects of the feminine sex than for those of the masculine persuasion!

*"Electric Illumination."* By W. T. O'Dea. (H.M. Stationery Office; pp. 40. Price 6d. net, by post 7d.)

This booklet has been issued for the information of those visiting the Special Exhibition on Electrical Illumination at the Science Museum. The exhibition, as already noted, is informative and skilfully arranged,\* and the idea of issuing a handbook tracing the development of modern electric lighting for the use of visitors was admirable. One must own, however, that this handbook is not quite the kind of publication one would have expected. Such a book, one would think, should make a broad appeal. It should contain pictures and facts that excite appreciation of the wonders of modern lighting. It should contain plain statements emphasising the importance of lighting in daily life, and simple hints on the use of light such as all can assimilate. But it ought not to assume the nature of a textbook—or which there are many written by experts—and it should not appeal primarily to those concerned with the planning of electric lighting installations, for whom the excellent series of handbooks prepared by the E.L.M.A. Lighting Service Bureau already exists. Many of the illustrations are at once recognisable as having appeared in these handbooks, and much of the data is evidently derived from the same source. It is characteristic that the "Recommended Illumination Intensities in Foot-candles" reproduced on pp. 27 and 28 are E.L.M.A. values, supplemented by values attributed to the American Illuminating Engineering Society (1921), and that the recommendations issued by the British Illuminating Engineering Society only last year are completely overlooked. It is likewise singular that in the brief bibliography at the end no mention of the publications of the Society is made. In other respects the booklet bears signs of hasty compilation. Without being pedantic one might justly take exception to the style, which in places scarcely does credit to the Board of Education or to the Science Museum. Finally, it may be suggested that a publication such as this, which is in effect the production of a Government department and contains records of illumination research undertaken by the D.S.I.R., ought not to bear in close proximity and on the back page of the cover, an advertisement of a commercial organisation.

\* "Light and Lighting," January, 1937, p. 22.



Our last article on "Light in Daily Life" has brought us some comments, for example, in regard to **lighting developments on the railways**. It is remarked that whilst the importance of light to the travelling passenger was emphasised, not much was said about the "passenger in waiting," for whom waiting rooms, even to-day, are not the last word in comfort!

We believe it used to be the view that travellers should not be cosseted too much at railway termini, for fear that they might prefer to linger instead of journeying on! Nowadays, however, there is a movement towards doing more for waiting passengers—as illustrated by the better restaurants and the cinema news theatres. One point that the commercial mind is not slow to grasp is that wherever crowds congregate—as at railway termini—there is business to be done! We should not be surprised to see facilities for entertainment in the vicinity of main railway stations increasing considerably in future years.

We have been asked if there are any simple **handbooks** on the calculation of **daylight illumination**. To the best of our belief there are no books that quite deserve this title—though there is need of them. There is Mr. Swarbrick's useful but somewhat detailed volume, and there are Mr. Waldram's original papers, most valuable, but not always easy to come by.

In addition, the way calculations of daylight are usually presented in original papers is apt to appear fearsome to the uninitiated. Now that there has been time to assess and digest such knowledge it ought to be possible to produce a compact and practical handbook within the grasp (physical and mental) of everyone.

The publication of Parry Moon's book, noticed in our last issue, leads to the enquiry how far the classic **formulae for distribution of light** from luminous sources of various shapes and dimensions (lines, discs, rectangles, etc.) are valuable in practice. Some people go so far as to declare that the calculation of illumination from first principles, applying the cosine and inverse square laws, is almost obsolete to-day, all practical calculations being based on the "**lumens per square foot**" method.

There is doubtless a good deal to be said for this view. We should say that such calculations on first principles are still instructive for the student, since they help him to understand and visualise the distribution of light. But it is a fact that this method is not ordinarily much used in modern lighting calculations. For one thing, it takes no account of reflected light from surroundings, which tends often to mask effects of the direct light, on which such calculations are based. Adaptation of the useful formulae data given in the E.L.M.A. handbooks to modern lighting equipment enables the **average illumination** to be quickly determined, even from relatively complex arrangements.

We are nevertheless still inclined to think that in the case of unusual installation ability to apply the old methods may be useful—especially as the lumen method, whilst giving the average value, does not indicate how the light is distributed in a room. (We might, perhaps, compare the two methods by recalling the differing procedure involved in taking out a polar curve in order to calculate mean spherical candlepower, and using an integrating sphere—which gives the m.s.c.p. at once, but affords no information on distribution.) A street, again (where there is usually little reflected light from surroundings), is surely a case where direct calculations are useful—though even here short cuts, such as the ingenious use of accurately taken photographs, tend to undermine the old practices!

Some members of the Illuminating Engineering Society, who have had the privilege of attending recent committee meetings at **Gas Industry House**, have asked us why we have not yet described the novel and enterprising methods of lighting, the effect of which in some cases resembles most closely that of architectural lighting fittings using electricity.

We have not overlooked this installation. We understand, however, that when the building is formally opened during the present month full descriptive data will be available. We hope to deal with this in our next issue.

We have been asked whether it is really true that in France the use of **yellow screens for automobile headlights** has been officially recognised. We believe that this is a fact, though the decision does not seem to obtain much support from expert opinion in this country—at least so far as any advantage in penetrating power in fog is concerned.

Readers will find elsewhere reviews of recent French works, one of which stresses other alleged advantages of yellow light; for example, in **diminishing the fatigue of reading**—a view which is in complete opposition to other opinions recently ventilated in these columns—we do not say that we assert to either contention!

We have had some discussion in regard to so-called "**architectural**" or **tubular lamps**. There seems to be a need to discriminate between the uses of such lamps. If they are intended as decorative objects, then they can serve their purpose well. The brightness is even and moderate, and by their aid a great variety of designs may be built up. On the other hand, we do not think that their relatively low brightness should encourage the belief that they need not be shaded when applied to illuminate something; for example, a notice or placard. In order to get the maximum effect from such an illuminated notice it should be the brightest thing in view; it is therefore better that tubular lamps mounted in direct proximity to it should be screened, even if their function of attracting attention is in some degree sacrificed.

# Literature on Lighting

(Abstracts of Recent Articles on Illumination and Photometry in the Technical Press)

(Continued from Page 19, January, 1937)

## I.—RADIATION AND GENERAL PHYSICS.

29. Colour Temperature of Tungsten Filament Lamps.  
Deane B. Judd. Frank. Inst., J., 222, p. 750, December, 1936. Bur. Stand. J. Res., 17, pp. 679-695, November, 1936.

A report is made of an investigation into the change of colour of the light from tungsten filament standard lamps during burning at constant volts, and the suitability of certain types of lamp as standards is considered.

S. S. B.

## II.—PHOTOMETRY.

30. A New Spectro-Photometer.

Anon. World Power, 26, p. 158, December, 1936.  
A description is given of a new type of industrial spectro-photometer recently developed.

C. A. M.

## III.—SOURCES OF LIGHT.

31. White Light Discharge Lamps.

Anon. Elect., 118, p. 8, January 1, 1937.

A description is given of a new mercury vapour discharge tube, in which the action of the fluorescent powders mentioned is to produce a white light.

C. A. M.

32. Bi-Post Base Lamp.

D. K. Wright. Light, V., No. 10, pp. 24-25, December, 1936.

A recently developed 1,000 watt general service lamp with a bi-post construction is described, with photographs and a diagram showing the lampholder.

C. A. M.

33. Electricity in Photography.

T. Thorne Baker. El. Rev., Vol. CXX., No. 3085, p. 45, January 8, 1937.

Describes new light sources which have been developed for the use of photographers. The significance of the colour temperature at which such lamps run is pointed out as being very great where colour photography is concerned.

R. G. H.

34. New Photoflood Lamp.

Anon. Gen. El. Rev., No. 11, p. 564, November, 1936.

Describes the new Mazda Photoflood No. 2 lamp, for use in commercial and amateur photography. The rating is 500 watts.

J. S. S.

35. New 1,000 Watt Lamp.

Anon. Gen. El. Rev., No. 11, p. 565, November, 1936.

A new 1,000 watt general service lamp is fitted with a bi-post base and internally frosted tubular bulb. The lamp is said to be more resistant to severe conditions than the normal general service type.

J. S. S.

## IV.—LIGHTING EQUIPMENT.

36. New Equipment.

Anon. Elect., 117, p. 795, December 25, 1936.

Elect., 118, p. 18, January 1, 1937.

Details, with photographs, are given of new designs of lighting equipment just introduced to the market.

C. A. M.

37. Filters for Artificial Daylighting, their Grading and Use.

H. P. Gage and Norman Macbeth. Am. Illum. Eng. Soc. Trans., 10, pp. 995-1022, December, 1936.

A relation is deduced between wavelength and spectral transmission for a filter designed to alter the emission of incandescent tungsten to the luminosity distribution of natural daylight. Practical filters and their use are described, together with illustrations of applications and equipment.

J. S. S.

## V.—APPLICATIONS OF LIGHT.

38. Classroom Lighting with Automatic Control.  
D. P. Caverley. Light, V., No. 10, pp. 5-9, December, 1936.

A description is given of lighting installations, with photoelectric control, in classrooms. The fittings are so disposed in order to level up, as far as possible, the diversity of natural illumination.

C. A. M.

39. Light and Architecture.

Anon. Am. Illum. Eng. Soc. Trans., No. 10, pp. 939-946, December, 1936.

Photographs of some representative architectural lighting schemes are given, with brief particulars of the system adopted in each case.

J. S. S.

40. Modern Stage Lighting Applied to Museum Groups.

R. C. Engelken. Am. Illum. Eng. Soc. Trans., No. 10, pp. 985-994, December, 1936.

A description of the problems of lighting museum groups of African animal life under natural conditions is given. The methods of lighting used to enhance the natural appearance of the settings are described in detail with photographs.

J. S. S.

41. Highway Lighting.

Anon. Light, V., No. 10, pp. 13-16, December, 1936.

Some details are given with photographs of a highway lighting installation near Schenectady, in which incandescent lamps with a bi-post construction are used in cut-off type fittings.

C. A. M.

42. Highway Lighting Moves to Higher Intensities.

Ralph P. Wagner. El. World, 106, p. 3771, December 5, 1936.

The author traces the development of highway lighting in the County of Schenectady, and gives details of that at present in use. The lumens per foot run of highway in the newest installations (mainly using sodium vapour discharge lamps) will be up to three times that in the original installations.

S. S. B.

43. Illuminated Kerbs.

Anon. El. Times, 90, p. 797, December 10, 1936.

A short account with photograph of illuminated street kerbs installed in Nottingham.

W. R. S.

## VI.—MISCELLANEOUS.

44. Street Lights Better with Photo Control.

O. W. Holden. El. World, 106, p. 3900, December 19, 1936.

An experiment has been made at Los Angeles, extending over three years, to investigate thoroughly the advantages of street lighting control by photo-electric equipment, and to determine the most suitable arrangement for this control. The conclusions reached are given, together with interesting points revealed in the experiment.

S. S. B.

45. Exterior Theatre Lighting.

F. M. Falge. Light, V., No. 10, pp. 28-34, December, 1936.

New materials and methods for the exterior lighting of theatres are discussed. Metal backgrounds with permanent finish are used extensively, together with fluted glass. Photographs are given.

C. A. M.

46. Some Lighting Features at the Great Lakes Exposition.

Anon. Elect. Engineering, 55, p. 1304, December, 1936.

An outstanding feature of this exhibition was the architectural lighting. Some details of this lighting are given.

S. S. B.

**47. Installing Illuminations.**

*H. R. Taunton.* El. Rev., Vol. CXX., No. 3086, p. 81, January 15, 1937.

Points out some of the more important of the I.E.E. regulations which apply to floodlighting installations of a temporary nature.

**48. Exposition Lighting.**

*Anon.* Light, V., No. 9, Expositions Number, 1936.

Numerous photographs are given of the results obtained from all types of lighting installations, both at the Texas Centennial Central Exposition, at Dallas, and at the Great Lakes Exposition, at Cleveland. Diagrams are also given indicating how effects shown were produced.

C. A. M.

**49. Coronation Illuminations: A Wonderful Opportunity; The Electrical Contractor's Part; Plans for Coronation Festivities.**

*H. T. Young, H. M. Drake, Anon.* El. Rev., Vol. CXX., No. 3086, pp. 79, 80, and 84, January 15, 1937.

General articles summarising points to be borne in mind in connection with the forthcoming Coronation activities in exterior lighting of buildings. R. G. H.

**50. Coronation Illumination Equipment.**

*Anon.* El. Rev., Vol. CXX., No. 3086, pp. 87-98, January 15, 1937.

A comprehensive survey of manufacturers' equipment for floodlighting and decorative illuminations.

R. G. H.

**51. Floodlighting and Illuminations.**

*W. J. Jones.* El. Rev., Vol. CXX., No. 3086, p. 82, January 15, 1937.

Describes, with illustrations, some good floodlighting installations, and suggests some desirable colour effects. The light sources available for such effects, together with data on the wattage of each source necessary to floodlight 1,000 sq. ft. of light-coloured surface to low, medium, and high brightness.

R. G. H.

## Light from Street Lamps

Through the courtesy of Mr. G. H. Wilson we are able to reproduce these two photographs illustrating one very curious effect of the presence of street lamps—in apparently delaying the fall of the leaves from adjacent trees. In one of the cases illustrated it is only the two trees immediately adjacent to the



street lamp that are affected, but in the other a series of five trees have preserved their leaves.

There is some horticultural support for the effect. It is common knowledge that as one goes southwards trees tend to retain their foliage longer—until, in the south of France, some trees, deciduous in more northerly regions, never lose their foliage completely.

## and the Foliage of Trees

This is usually regarded as a matter of temperature, but it is quite likely that the brighter sunlight of the south is also an influence.

Presumably the trees here illustrated will lose their leaves completely in course of time. One may, therefore, have to watch for the right moment for



the effect to be seen. One would think, however, that it would be quite frequently observed by public lighting engineers—especially in such places as Chelmsford, visited by the A.P.L.E. last year, where many tree-lined boulevards exist.

We wonder whether any of our readers can give us confirmatory evidence?

## Improved Street Lighting in Fulham

As we go to press we receive particulars of this interesting new installation officially opened on February 1. We propose to give fuller data in our next number, but for the moment may mention that the lighting is effected by Osira electric discharge lamps in G.E.C. Di-fractor lanterns. Practically all the principal through traffic routes are affected, about eight miles of roadway being lighted by about 460 fittings. In all the roads (except the Fulham Palace-road, where, owing to the rather close spacing, 250-watt lamps were used) 400-watt lamps are employed. A feature is the use of a novel type of reinforced concrete pole and bracket.

## Electrical Association for Women Spring Programme

The E.A.W. has, as usual, arranged well-filled and attractive programmes, alike for the London Branch, the Teachers' Circle, and the Demonstrators' Circle. We notice that all unite on March 1, when Mr. R. O. Ackerley is to give a Lecture-Demonstration on Colour Lighting at the E.L.M.A. Service Bureau, whilst on March 15 Mr. Pender Chalmers is giving a lecture on "Light and the Hostess." A series of attractive visits to the works of the Edison Swan Electric Company Ltd., the Franco-Signs Factory at Hendon, and elsewhere has been arranged. The programme winds up with the Coronation Ball at the Park Lane Hotel on April 30.



# Recent Patents

(Abstracts of recent Patents on Illumination & Photometry.)

**No. 456,040. "Improvements Relating to Positive Carbons for Intensive Arcs with the Beck Effect."**

*Compagnie Lorraine de Charbons pour L'Électricité.* January 25, 1935. (Convention, France.)

According to this specification, an arc carbon anode for a high intensity arc exhibiting the Beck effect of a deep positive crater of very high intrinsic brilliance, and a long discharge is cored with a material comprising carbon and one or more of the metals iron, nickel, cobalt, manganese, chromium, and vanadium, having atomic numbers between 23 and 28 inclusive, the weight of metal being preferably between 15 and 70 per cent. The core may also contain oxides, fluorides, oxy-fluorides, or other insoluble compounds of rare earth metals, e.g., cerium fluoride. Increased intrinsic brilliancy and greater stability of the arc at higher current densities are said to be attained.

**No. 456,094. "Improvements in and Relating to Luminaires."**

*Holophane, Limited.* (Communicated by Holophane Company (Inc.) of U.S.A.) February 3, 1936.

This specification describes a lighting fitting comprising a prismatic light transmitting member and a reflecting member, which reflects light from the source to the transmitting member. The reflecting member co-operates with the transmitting member so that light emanating from the two transmitting faces of each prism of the transmitting member includes light from the source emitted on one side of the axis of the system, and light from the reflector emitted at a similar angle on the other side of the axis. The fitting is suitable for interior illumination.

**No. 456,184. "Improvements in Luminous Electric Discharge Lamps."**

*The General Electric Company, Limited.* (Communicated by Patent-Treuhand Gesellschaft für Elektrische Glühlampen m.b.H., Germany.) August 19, 1935.

According to this specification, the stabilising series resistance of a discharge lamp is provided by a resistive layer on the outside of the lamp envelope covered by an insulating layer, which also may cover the leads of the lamp and may act as a light fitter. The invention is particularly applicable to miniature lamps. The insulating coating may be a cap of cellulose or cellulose derivative, kept in a solution of formaldehyde, which shrinks tightly on to the envelope.

**No. 456,204. "Improvements in and Relating to Arc Lamps."**

*Opticolor Aktiengesellschaft*—February 1, 1935, March 19, 1935, December 24, 1935. (Convention dates, Germany, Cognate Application.)

This specification covers an arc lamp for projection of lenticular films, in which the positive electrode is closely surrounded by a cooled sleeve, which extends closely up to the burning end of the electrode and prevents access of air to the outer peripheral surface thereof, and a magnetic field symmetrically surrounds the axis of the arc to steady the crater.

**No. 456,250. "Improvements in and Relating to Electric Discharge Lamp-Circuits."**

*The British Thomson-Houston Company, Limited.* February 28, 1935. (Convention, U.S.A.)

This specification covers a circuit arrangement for a discharge lamp comprising a main transformer with its primary connected to the supply and its secondary arranged to energise the lamp and the primary of a high reactance ionising transformer in series, the secondary of the ionising transformer being connected also to energise the lamp in series with the winding of a relay. The relay contacts, when the relay is de-energised, connect the secondary of the main transformer to the primary of the ionising transformer only for starting the lamp, but, when the relay is energised, the secondary of the main transformer is connected with the lamp and primary of the ionising transformer in series, the secondary of the ionising transformer remaining connected to the lamp.

**No. 456,325. "Improvements in or Relating to Luminous Discharge Lamps."**

*Corning Glass Works.* January 8, 1936. (Convention, U.S.A.)

This specification describes an opal glass for the manufacture of fluorescent luminous discharge tubes, of which, it is said, the density will not change when the fabricated glass is reheated and cooled. The glass is fluorescent, has a maximum iron content of 0.02 per cent.  $Fe_2O_3$ , and results from melting a batch containing fluorspar and a fluorine compound of the group comprising cryolite, sodium silico fluoride, potassium fluoride, and aluminium fluoride, the fluorspar and the fluorine compound being between the ratios of 1:1 and 3:1 respectively. Specific compositions are given in the specification.

## Architects' Conferences on Lighting

The following programme of Conferences for Architects has been arranged at the E.L.M.A. Lighting Service Bureau (2 Savoy-hill, London, W.C.). All conferences will commence at 7 p.m.

Jan. 27, 1937.	Research and Progress in Lighting.
Feb. 3, 1937.	Recent Experiences in Lighting.
Feb. 10, 1937.	Regulations for the Installation of Electrical Services.
Feb. 17, 1937.	Lighting Plans for the 1937 Paris Exhibition.

On the opening date there was a lecture by Mr. W. J. Jones, the opener of the discussion being Mr. Howard Robertson. On February 3, the speakers include Mr. T. P. Bennett, Mr. Serge Chermayeff, and Mr. R. O. Sutherland, and on February 10 Mr. C. F. Raphael and Mr. H. W. Swann (Chief Electrical Inspector of Factories) and Mr. C. Lovett Gill, F.R.I.B.A. are to speak. At the final meeting, which promises to be particularly interesting, Monsieur H. H. Maisonneuve, of Paris, is to give an address and the discussion will be opened by Mr. Ian Jeffcott.

# Street Lighting

## (With Special Reference to Electric Discharge Lamps)

In a paper on the above subject read before the Junior Institution of Engineers on January 8, Mr. E. W. C. Day urged that street lighting had reached a stage demanding the full-time service of engineers specialising in the subject. Unfortunately, the average Lighting Committee does not seem to realise this! The paper, therefore, which was presented on simple lines, was an effort to illustrate the variety of problems which to-day demand solution.

### Visibility.

In emphasising the importance of good visibility (a car driven at 45 m.p.h. needs a clear view 134 ft. ahead), Mr. Day suggested that (1) the eye is specially sensitive to the yellow green waveband, (2) increased acuity of vision is gained by enhanced contrast, and (3) mono-chromatic light produces sharp images, as aberration is a minimum. Discharge lighting meets all these three conditions of good visibility. It is suggested, however, that foot-candle measurements do not represent relative visibility, and that some form of "visibility ratio," in comparing different systems, is needed. Another very important condition is that when two systems of lighting are compared similar road surfaces, viewed under both wet and dry conditions, should be adopted.

### Best Positions for Light Sources.

Considerable importance attaches to the positions of light sources. The M.O.T. recommendation suggests that normally the distance between sources should not exceed 150 ft., but it is also emphasised that the positions of lamps should be selected with a view to getting maximum visibility rather than uniform spacing. In this connection the author emphasises the importance of "grading" the illumination so as to avoid intense contrasts in passing from a brightly lighted street to a much darker one, and he also suggests desirable positions for light sources in main streets, such that they do not come within the full view of drivers entering from a relatively dark area. One practical suggestion is that light sources should be *behind* vehicles turning into or across the main traffic stream in relation to approaching vehicles. The silhouette of the waiting traffic is distinctly advantageous to the oncoming driver, to whom traffic lights, seen sideways, may not be distinguishable. Importance is also attached to kerb-line illumination. The "chequering" device, now being more frequently adopted by local authorities, is a great help.

In the next section of the paper the author dealt somewhat fully with typical forms of lighting equipment, deplored that initial cost so often weighs heavily with committees, so that the price of a lantern may be the deciding factor. It is, nevertheless, better to incorporate a really first-class lantern, even if at the expense of spacing and artistically-designed poles.

### Two-Part Tariffs for Street Lighting.

Much has been heard of the "two-part tariff" in other fields. The author suggests that such a tariff should be offered for all-night lighting, thus encouraging the midnight to dawn load, which is valuable to supply undertakings.

Reviewing methods of control, the author alludes to the problem of securing extinction on the approach of enemy aircraft. Many present systems of control are at a disadvantage when speed of operation is the main consideration. The author contends that some form of frequency-operated relay (such as was actually applied in a mid-Surrey rural area in 1926) is really essential from this standpoint.

### The British Standard Specification.

In the concluding section of the paper the use (and misuse) of the British Standard Specification was discussed. There is too great a tendency to use the minimum light values specified in the report as a desired maximum, with the result that unsatisfactory forms of lanterns are installed. It is too frequently assumed that if the recommended test point illumination is attained, all that is necessary has been done. This may not be the case, especially if reliance is placed on a form of lantern apparently expressly designed to furnish this particular value, irrespective of conditions on other parts of the roads.

### The Need for Independent Public Lighting Engineers.

Finally, the author returns once more to the need for trained public lighting engineers, quoting with approval the remarks in Mr. A. Cunningham's presidential address to the Illuminating Engineering Society regarding the pathetic spectacle of a Lighting Committee having to accept figures for lighting costs, simply because they have no trained and independent expert to whom they can turn for a proper report.

It is significant that the recommendations in the interim report of the M.O.T. Committee contain frequent reference to unsatisfactory features of the present systems of administration of public lighting.

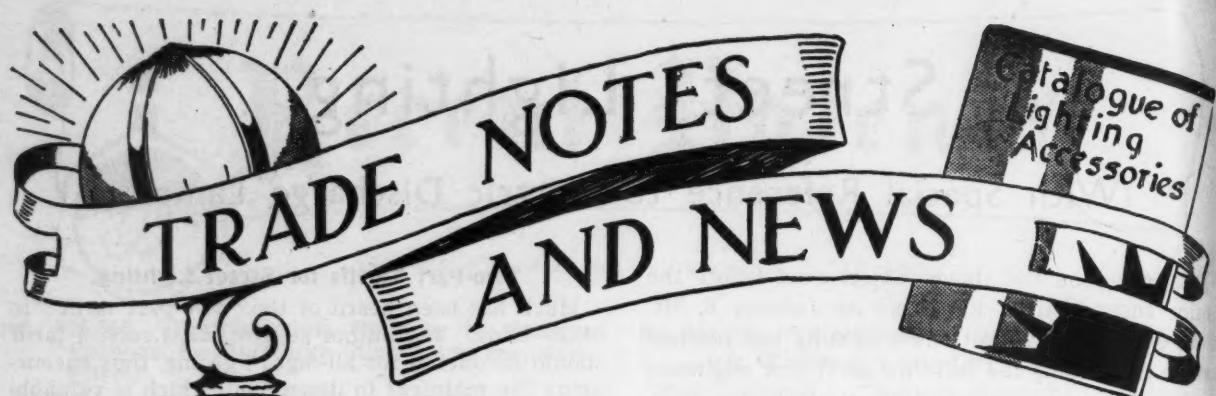
## I.E.S. Transactions

### Binding Cases

We are asked to mention that a new supply of Spring Binding Cases for copies of the I.E.S. Transactions is now available. (These Spring Cases enable Transactions to be kept in order, but permit any individual copy to be removed or replaced at will).

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### The Cameo Theatre

The Claudegen installation at the Cameo Theatre, near Victoria Station, which was opened on December 14, is certainly one of the most striking examples of the use of fluorescent tubing at the present time. It has been described as a "pinnacle of coloured light," for which about 3,000 feet of tubing are employed.

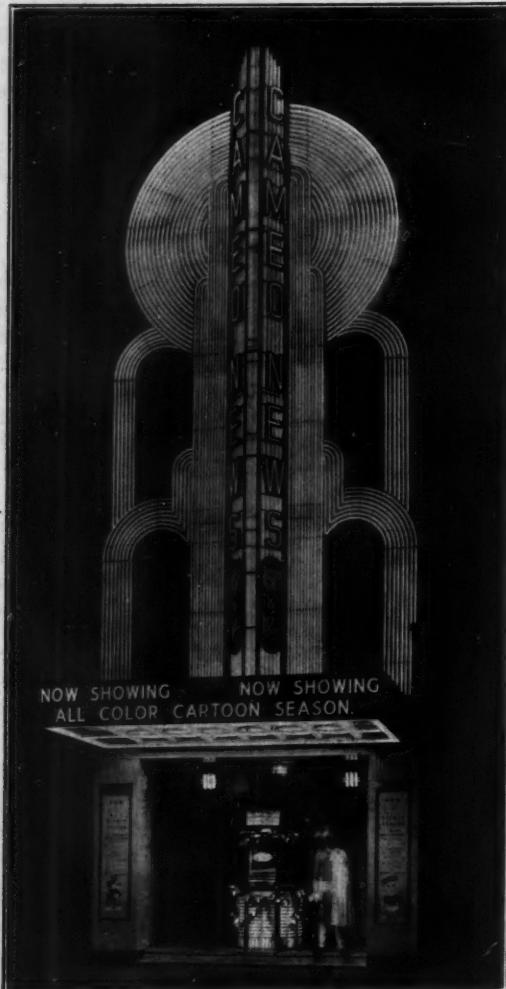
The vertical V-shaped sign down the centre is about 35 ft. high, and bears the words "Cameo News" in 24-in. letters. Windows on either side of the sign are outlined by banks of tubing. For these, No. 21 and 23 Cleora and also opal red tubes are used, whilst the circular design at the top is in 20 mm. No. 103 Cleora tubing.

Panels of lenticular glass are fitted to the front and returns of the canopy, so that a double row of letters

can be fixed to form interchangeable signs. Each line is illuminated by four horizontal lines of No. 21 Cleora tube. The underside of the canopy is fitted with a triple blue installation consisting of two lengths of No. 103 Cleora with a centre line of No. 21. The installation consists of seven units running from back to front of the canopy, one unit down the centre running parallel with the front edge, and a continuous unit all round the canopy edges. The combination of colours under the canopy is pleasing, and the illumination furnished on the paving is quite impressive.

A novel and interesting feature is the "iridescent pay-box" seen in the foreground, the exterior of which is constructed of glass blocks illuminated by ten sets of five 3-ft. vertical tubes, which give a vivid rainbow effect.

The architect for the installation is Mr. Alister G. MacDonald.



The Striking Display of Luminous Tubes at the Cameo Theatre (Victoria, London, S.W.1.).

### Modern Lighting in a Boot and Shoe Factory



The picture above illustrates the appearance of a portion of the extensions of the Boot and Shoe Factory of Messrs. Allinson and Co., Northampton, in which Benjamin Glassteel Diffusers have recently been installed throughout. The photograph suggests that excellent diffusion of light has been obtained. We have before us a copy of a letter addressed to Benjamin Electric, Ltd., by Messrs. Allinson and Co., expressing their great satisfaction with the conditions, and remarking "Our grade of work demands a very high standard of accuracy, and we find the increased efficiency of your light an invaluable asset." Such a handsome acknowledgment by a manufacturer of the importance of good lighting surely deserves to be put on record!

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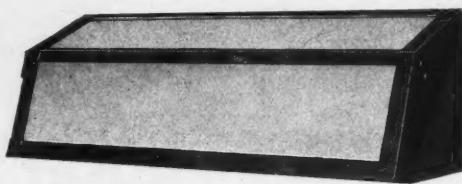
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## Optical Trades Exhibition

An Exhibition organised by the Optical Trades was held in the Horticultural Hall, Westminster, from February 2 to February 4. At the inaugural luncheon, when representatives of kindred organisations and societies were present, Sir Kingsley Wood (Minister of Health) drew attention to the remarkable progress that had been made in home manufacture of spectacles and optical apparatus as compared with the conditions that obtained only a few years ago. Now 75 per cent. of the trade is in the hands of British manufacturers. The Exhibition was attractively laid out, and some of the elaborate apparatus designed for sight-testing with accuracy, speed, and comfort was evidence of the progress indicated by the Minister of Health. Of particular interest to lighting engineers was the exhibit of polaroid glass with demonstrations ingeniously arranged to show how completely the glare from specular reflection off a shiny road surface could be avoided by the use of this glass.

## "Anglites"

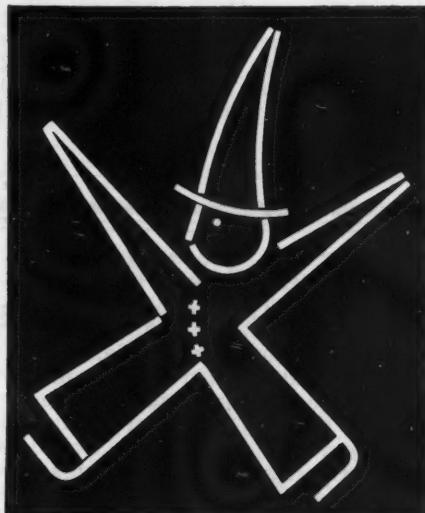
Under this title Benjamin Electric, Ltd., present a form of unit, here illustrated, which seems to be of a very compact and adaptable nature, lending itself well to many types of concealed lighting. Such appli-



cations as the lighting of shop-windows and cornices readily suggest themselves, but there are other opportunities in lifts, on staircases, etc.; whilst it is also possible by grouping "anglites" together to build up luminous columns and other special types of fittings.

## "I'm Electric"

"I'm Electric," the odd little man made familiar by E.D.A., has recently appeared in a new setting, outlined by Osram architectural lamps.



As the picture shows, the figure is made up very simply by combinations of straight and curved tubular lamps, with an Osram pigmy lamp for the eye.

## Electric Illumination at the Science Museum



A view of a section of the Electric Illumination Exhibition at the Science Museum, South Kensington, which has already been visited by many thousands of the general public. In the foreground is seen the historical exhibit illustrating the development of light sources throughout the ages.

## Design and Industries Association Exhibition of Fittings in Manchester

An enterprising step on January 25 was the opening by the Lord Mayor of Manchester of a display of modern lighting fittings initiated by the Design and Industries Association. A lantern lecture entitled "Lighting and Lighting Fittings; Design and Demand" was delivered by Mr. A. B. Read on January 27. There is every reason that the public should be educated to demand fittings of good style. Comparatively few firms produce designs which conform to the D.I.A. standards. It is stated, however, that of fifty firms approached 50 per cent. replied, and that an excellent variety of "best sellers" was assembled in the Manchester Corporation show-rooms.

## Street Lighting With Gas

The yearly statistics published by the gas industry show how lighting authorities in many large towns and cities continue to rely on gas lighting for the illumination of streets under their control. In the area of one London gas undertaking, for example, the number of lamps in 1935 was 48,748, and in 1936 51,477, an increase of 2,729 lamps. The 1936 figures show that Southport has 1,062 more gas lamps than in 1935; Newcastle's increase is 917 and Bournemouth's 996; at Derby there are an additional 689 lamps; and other districts showing the increasing use of gas for public lighting are Edinburgh (546 more lamps than in 1935), Belfast (501), Sheffield (475), Leeds (382), Halifax (563), Coventry (324), Blackpool (333), Nottingham (304), and Wandsworth (317). Altogether, the fourteen districts named above have a total of 196,878 public lamps lighted by gas, an increase over 1935 of over 10,000 lamps.

The G.W.R. Station at Leamington, which is being rebuilt, is to have a system of modern gas lighting for the platforms and the approach road, which will consist of 6-mantle upright lamps, clock-controlled, and mounted on 15-ft. high columns. The sum of £1,350 is to be expended by the Leamington Town Council on improvements in the lighting of the town.

Warwick Corporation has recently extended the number of gas street-lamps in commission. There are now 344, of which 234 are clock-controlled. About a dozen gas-illuminated traffic bollards are in use.

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## Lighting a Modern Printing Works

The lighting of a completely new factory usually presents exceptional opportunities and the treatment of the new "Radio Times" works of Messrs. Waterlow and Sons at Park Royal is, therefore, of interest.

A feature is the several uses of mercury electric discharge lamps, the light from which was con-



Night View of a section of Messrs. Waterlow & Sons new "Radio Times" factory at Park Royal, lighted by Holophane Extensive Type Industrial Reflectors in Holophane electric discharge lamps.

sidered good for black and white process work, affording clearer definition.

Considerable numbers of Holophane lighting units have been installed. In the press room—naturally one of the most important—general aisle lighting for the lower section with the new circul-Holophane Bulkhead light fitting is provided. Along each side of the presses Widerlite units located to ensure

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adequate lighting at the ends of reel spindles are installed. (For this lower section lighting gas-filled incandescent lamps are used). On the press room floor general lighting from units 13½ ft. high is supplemented by special lighting for the cylinders at a distance of about 7 ft. For the general lighting a special unit equipped with 150 watt electric discharge lamp, has been designed. For the directional lighting on the cylinders a lantern unit embodying two of the concentrating refractor panels, with the sides



A Night View of the Press Room where electric discharge lamps in special Holophane Industrial Units are again installed.

and bases of the lantern fitted with flashed opal glass, has been adopted.

In the compositors' department Holophane reflectors with 150 watt mercury electric discharge lamps are spaced nine feet apart and provide 20 foot-candles. In the type foundry similar Holophane industrial reflectors are mounted sixteen feet apart, giving 8 foot-candles.



A "Niphon" market lighting installation, showing main feeding sockets fitted to a lamp standard.

## MARKET LIGHTING

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## G.E.C. Branches

The branch of the British General Electric Co., Ltd., at Christchurch, New Zealand, has been removed to Magnet House, Gloucester-street, Christchurch, and that at Auckland, New Zealand, has been removed to 26, Customs-street East, Auckland.

### "Licht und Lampe": 25th Anniversary Number

As we go to press our attention is drawn to the issue of a special number of *Licht und Lampe*, which is celebrating its twenty-fifth anniversary. Our German contemporary is thus not very much younger than *Light and Lighting* (originally published in 1908). To have maintained a journal devoted exclusively to lighting during a quarter of a century is no small feat, and we heartily congratulate *Licht und Lampe* on attaining its twenty-fifth anniversary. The issue commemorating the event contains articles reviewing progress in illuminating engineering, lamp technique, and consumption of electricity for lighting during the past twenty-five years, and publishes congratulatory messages from many bodies interested in the lighting industry. We may add that the printing, paper, and general get-up of the journal are excellent. A display page entitled "Wo Licht und Lampe entsteht" depicts the various stages of production of the journal, the activities of the numerous staff, and the imposing premises from which it is issued—in this respect we fear we couldn't yet do quite so well!

### Technical Publications Received

ELECTRON TUBES IN INDUSTRY. By Keith Henney. (McGraw Hill Publishing Co., Ltd. Price, 30s.)

THE PRACTICAL ELECTRICIAN'S POCKET Book, 1937. (Odhams Press Technical Book Department. Price, 2s. 10d. post free.)

### Catalogues and Advertising Literature

We invite all firms in the Lighting Industry to send us new catalogues as they appear, for reference in these columns.

BRITISH THOMSON HOUSTON Co., LTD.—Leaflet describing B.T.H. handlamp transformer, a complete safeguard against electric shock.

CURTIS LIGHTING COMPANY OF GREAT BRITAIN, LTD.—Illustrated leaflet demonstrating the qualities of new fittings based on "Reflected-Diffusion."

FRANCO-BRITISH ELECTRICAL Co., LTD.—Catalogue, including suggestions for Coronation decorations; new features are "animated greetings" in electric lamps and schemes for neon outlining of buildings.

HOLOPHANE, LTD.—List (No. 500 Section 4a) featuring general service flood projectors of the vertical burning, long range, and square box (wideangle) types.

SIMPLEX ELECTRIC COMPANY, LTD.—Catalogues of Iron-clad Switch and Fuse Gear and Conduit Fittings.

We invite Enquiries from Readers or Particulars of "Wants" such as might be satisfied by Advertisers in this Directory.

## Contracts Closed

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Great Northern Railway Co. (Ireland): for the supply of Mazda lamps for twelve months ending December, 1937.

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## "LUX"

(La Revue de l'Eclairage)

WE have pleasure in announcing to our readers that we have entered into an arrangement to receive subscriptions for the French Journal "Lux" (La Revue de l'Eclairage). The subscription per annum is 30 francs, the approximate equivalent of which in English money is Seven Shillings and Sixpence (7/6).

"Lux" is the only French journal which specialises in all aspects of Lighting; it is the official organ of the Association Française des Ingénieurs de l'Eclairage (equivalent to the Illuminating Engineering Society in France).

It furnishes a complete record of interesting developments in lighting in France and on the Continent. It is fully illustrated and in particular devotes a considerable number of its pages to Decorative Lighting.

By studying these articles and the numerous photographic reproductions of modern lighting installations the reader can readily gain an excellent impression of French methods and practice in matters of Illumination.

Applications for subscriptions will be received by "Light and Lighting," 32, Victoria Street, London, S.W.1.

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February,

# INCREASE IN GAS STREET LIGHTING

The following figures are quoted from the 1935 edition of "Field's Analysis." This authoritative annual publication analyses the working results of the more important company-owned and municipally-owned gas undertakings in the British Isles.

#### STREET LIGHTING

(Number of Public Lamps)

	1934	1935
COMPANY UNDERTAKINGS - - -	193,481	<b>196,766</b>
LOCAL AUTHORITY UNDERTAKINGS - -	205,766	<b>208,381</b>

#### SALE OF GAS FOR PUBLIC LIGHTING

(Therms 1,000's)

	1934	1935
COMPANY UNDERTAKINGS - - -	16,567	<b>17,272</b>
LOCAL AUTHORITY UNDERTAKINGS - -	17,818	<b>18,423</b>

Among the cities covered by this statistical review are London, Liverpool, Dublin, Newcastle-upon-Tyne and Sheffield (served by company undertakings); while the municipally-owned undertakings analysed include those at Birmingham, Leicester, Leeds, Edinburgh, Belfast, Manchester, Glasgow and Nottingham.

It is interesting to observe then that among gas undertakings, whether company or municipally directed, the sales of gas for public lighting are going up and the number of gas lamps in use is increasing.

*Issued by the*

**BRITISH COMMERCIAL GAS ASSOCIATION**  
Gas Industry House, 1, Grosvenor Place, London, S.W.1.

# HOLOPHANE SCIENTIFIC ILLUMINATION

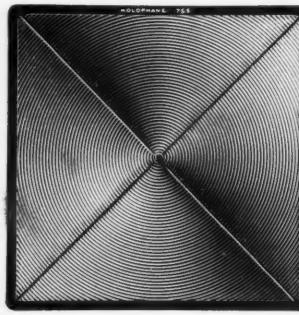


## AT THE RECONSTRUCTED COLSTON HALL BRISTOL

Look at the untouched Night Photos above, and then consider the problem which confronted the HOLOPHANE Engineers in the preparation and design of a Modern Lighting Scheme to suit the requirements.

Stringent regulations concerning the vision and acoustics of the hall, stipulated no projection brackets or suspended fittings.

The large area of the hall, in conjunction with a high intensity for this class of installation added further difficulties.



The width of the hall is 80 ft., and the ceiling height is 60 ft. The Lighting had to avoid any glare or light spill which would interfere with the audience or the massed choirs who sat on the stage facing the audience at musical festivals.

The positive control of light by the HOLOPHANE CONTROLENS enabled the HOLOPHANE Experts to overcome all these difficulties, and design a scheme of Lighting which is an outstanding success.

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